24 JUNE 1954

NINEPENCE

ELECTRICAL TIMES

FOR HOT INSTALLATIONS

BICC SILICONE RUBBER INSULATED CABLES

BRITISH INSULATED CALLENDER'S CABLES LIMITED
21 BLOOMSBURY STREET, LONDON, W.C.1

Send for publication No. 261

British European Airways Photograph

at the B E A Engineering Base, LONDON AIRPORT

J. & P. HAVE SUPPLIED . . .

This new Engineering Base now being completed for British European Airways will soon be catering for the bulk of their fleet and providing employment for no less than 1,200 engineers, technicians and staff.

The four substations feeding the base are equipped with J. & P. Transformers and Switchgear (h.v. & l.v.), and for the main power supplies, J. & P. Aluminium Sheathed Power Cables have been used exclusively.

Consulting Civil Engineers:
MESSRS. SCOTT & WILSON, KIRKPATRICK & PARTNERS
Consulting Electrical Engineers:
MESSRS. BARLOW, LESLIE & PARTNERS
Electrical Contractors:
MESSRS. RASHLEIGH PHIPPS & CO. LTD.

Specialists in Industrial Electrification

H.V. & L.V. SWITCHGEAR

•

TRANSFORMERS

•

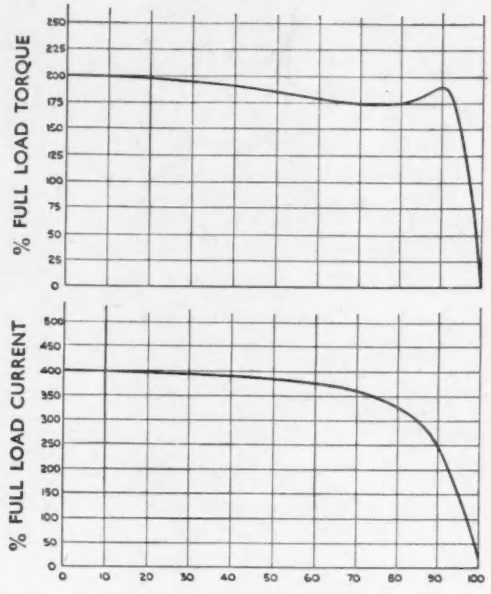
ALUMINIUM SHEATHED POWER CABLE

JOHNSON & PHILLIPS LTD.
CHARLTON, LONDON, S.E.7

Is starting performance a bit of a problem?

"TRISLOT" may be the whole of the answer

Before you specify a slip-ring motor on account of starting conditions, consider the L.S.E. TRISLOT squirrel-cage motor.



Typical performance curve for a direct-switched Trislot motor.

★ **The TRISLOT develops a higher starting torque with lower starting current than a standard squirrel-cage motor (200% F.L.T. with 400% F.L.C., direct-switched, is typical).**

★ **It needs only the simplest starting equipment and has only one starting current peak, compared with the more expensive and complicated slip-ring motor with its starting and accelerating peaks. Running efficiency is equal to that of the slip-ring motor.**

★ **The TRISLOT is physically interchangeable with standard L.S.E. squirrel-cage motors of equivalent rating, and it is available with all normal types of enclosure and forms of mounting.**

Many TRISLOT motors up to about 50 h.p. are in stock.

LAURENCE, SCOTT & ELECTROMOTORS LIMITED

Specialist Makers of Electric Motors since 1883

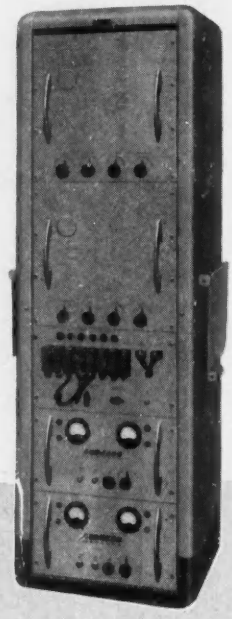
L.S.E. NORWICH MANCHESTER LONDON AND BRANCHES

FERRANTI

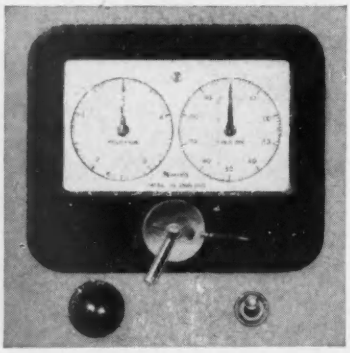
HIGH SPEED TESTING EQUIPMENT

for
A.C. singlephase meters

The test bench carries two rows of twenty meters, the upper row warming prior to testing, whilst the lower row is being calibrated.



Conversion equipment supplied separately for modernising existing conventional test equipment.



One of the slave sub-standard counters which are mounted on a panel below the meters on test.

A completely self-contained unit for installation in new testing stations for expediting meter adjustments and calibration to close limits. Meters are stroboscopically tested on high loads and by timing from the counters on low loads.

Write for list M.54 which contains full particulars.

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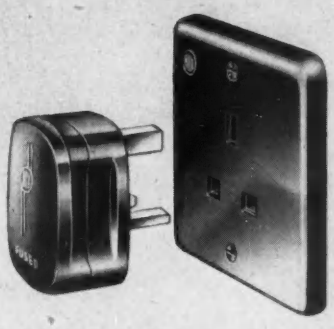

13 AMP ACCESSORIES TO B.S. 1363

★ SOCKET OUTLET
★ SWITCH SOCKET
★ TWIN SOCKET OUTLET

AVAILABLE FOR SURFACE OR FLUSH MOUNTING
BROWN, CREAM OR IVORY
ALL FITTED WITH CERAMIC BASES ELIMINATING TRACKING
DETAILS ON REQUEST

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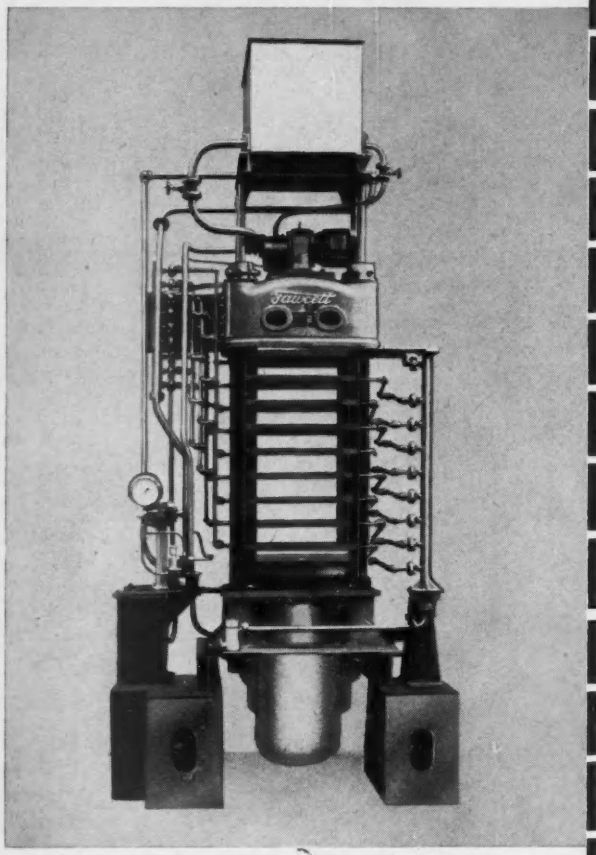
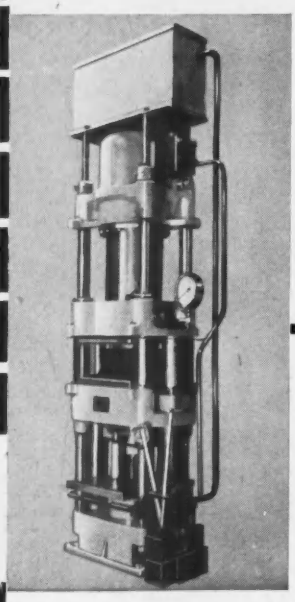
have you a pressing problem?

Then a hydraulic press from our wide range will probably solve it. If, however, it is a very unusual problem, Fawcett designers will gladly co-operate to produce a machine that will economically, yet efficiently, overcome it. For nearly two hundred years we have served industry in a whole-hearted attempt to cut production costs and increase efficiency. Methods change, new materials are developed, but the Company of Fawcett, Preston is always in step.

Fawcett EST 1758 HYDRAULIC PRESSES



This 500-ton up-stroking multi-platen Press has a self-contained pump and oil reservoir mounted on top. Platens are arranged for alternate steam heating and water cooling.



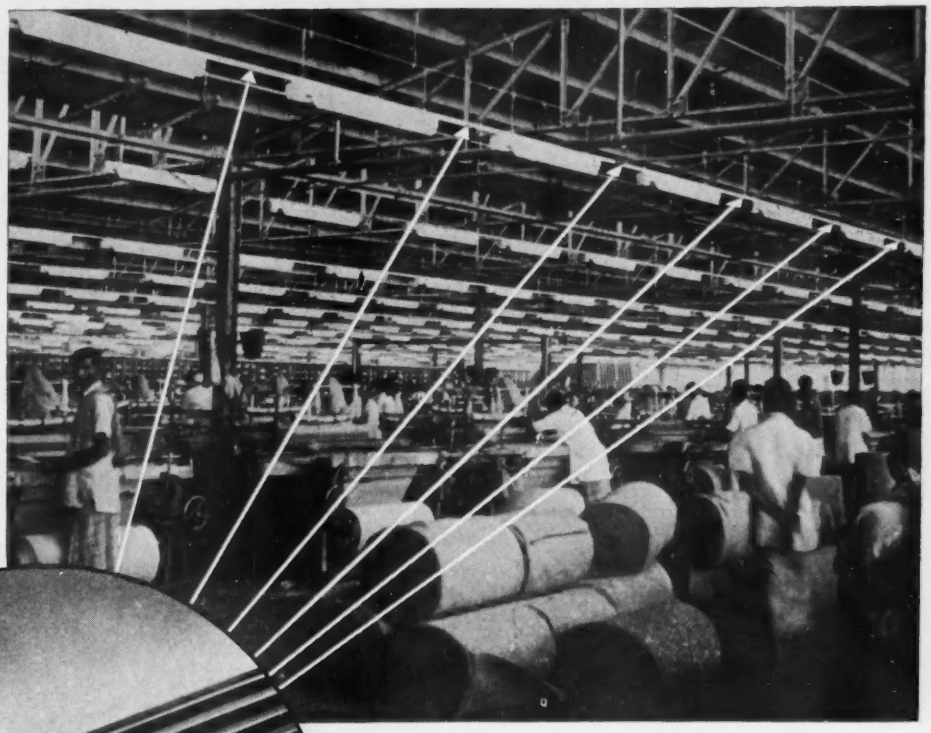
A typical Fawcett hydraulically operated, down-stroking, 100-ton plastic moulding press.

Special presses designed to suit individual requirements

FAWCETT, PRESTON & CO LTD BROMBOROUGH, CHESHIRE PHONE: ROCKFERRY 2201 (5 LINES)

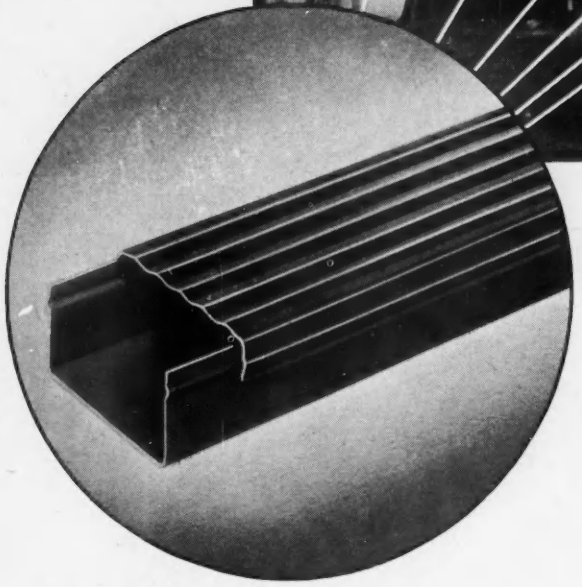
P 4623

CHANNEL CONDUIT INSTALLED IN THE WORLD'S 3 LARGEST JUTE MILLS



In this view of the loom section of Adamjee No. 1 Mill B.T.H. fluorescent lighting fittings are seen attached to 2″ x 1″ Channel Conduit.

(Photograph reproduced by permission of Engineering Consultant H. M. NIMMO, M.Sc., B.E., A.M.I.E.E.)



The Adamjee Mills at Narayanganj in the Dominion of Pakistan are claimed to be the largest of their kind in the world. Each of the three mills covers an area of about 500,000 sq. ft.

These mills are illuminated by more than 6,500 fluorescent fittings which are supported by 2″ x 1″ Channel Conduit. Altogether, some 150,000 feet of this cable trunking has been installed. It carries all the circuit wiring and has resulted in exceptionally low installation costs.

★ *Channel Spring Capped Conduit costs less to buy, install and maintain than any other form of cable trunking. For full information, write or 'phone for a copy of pamphlet R.A. 16.*

Sizes stocked: 4″ x 4″, 4″ x 3″, 3″ x 3″, 3″ x 2″, 2″ x 2″, 2″ x 1″, 1″ x 1″ and 1″ x ½″.

CHANNEL "Spring Capped" CONDUIT

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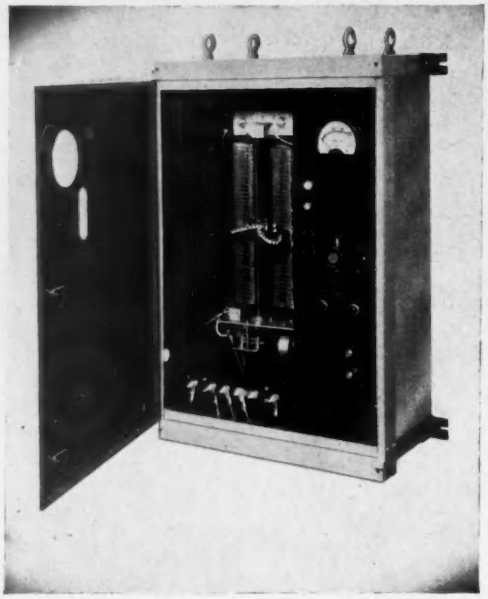
5kVA AUTOMATIC VOLTAGE REGULATOR

THE AUTOMATIC VOLTAGE REGULATOR TYPE P.857 provides a constant output voltage with varying load current and mains voltage. The operation of the instrument is independent of normal variations in frequency, load and load power factor. The equipment is contained in a robust dust-proof case and it may be bolted to the floor or wall, or mounted, forward or recessed, on a standard 19-inch rack.

- **Stabilised A.C. Output Voltage:** The Stabilised A.C. Output Voltage may be adjusted to any value between 210 and 240 volts.
- **Accuracy of Stabilisation:** The Output Voltage is controlled within ± 1%.
- **Input Voltage Variation:** The output remains constant over an input range of 50 volts.
- **Maximum Continuous Load Current:** 22 amps.
- **Control:** Either Automatic, Manual, or from an external D.C. source.
- **External Automatic Control:** The control voltage may be either positive or negative relative to earth. The control current required is approximately 1.5 mA.



Full details of this or any other Airmec equipment will be forwarded gladly upon request.

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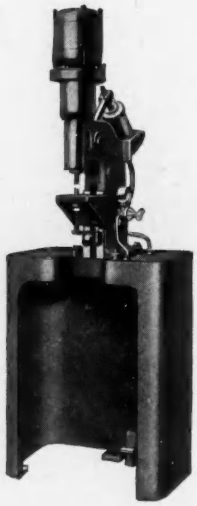
for effortless, silent riveting!

Whether it's a small aluminium rivet in a fragile component or a large steel stud in a gear box, a TT Rivet Spinner will give it a perfectly finished head and improve the look of your product. The process is quick and efficient—and it is equally suitable in certain applications for spinning over bushes and flanges.

Models available for Foot or Air Operation, with capacity up to ¾" dia. in steel. We also manufacture a full range of Rotary Vibrating Riveting Hammers.

We offer our expert advice and shall be pleased to demonstrate on your samples.

Contact your usual Machine Tool Merchant or :—



RS.3. VMD.AE 3/16" Cap. Rivet-Spinning Machine on Cabinet

TT TURNER MACHINE TOOLS LTD.

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They're lively lads at Lorival

When it's a question of plastic or ebonite mouldings there's always a Lorival answer. They're lively lads at Lorival, with technique and imagination. They put a beautiful finish on their products, and they offer you pleasing design, keen prices and rapid delivery. You can safely leave it to them.

✱ *PAPER-FILLED UREA MATERIAL is the ideal medium for this Bathjoys Display Stand for Reckitt & Colman Limited. The design is rigid, yet without heavy sections, and the moulding is produced in one piece by the compression method. The colour chosen was cream, and recessed lettering in the front, filled in with green wax, provides a striking contrast.*

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UNITED EBONITE & LORIVAL LTD · LITTLE LEVER · NEAR BOLTON · LANCS

Dependability

INSTRUMENT WIRES
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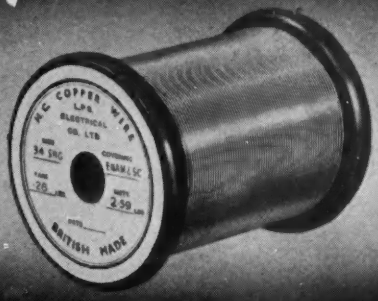

TELEPHONE & RADIO CORDS
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ALPERTON WEMBLEY MIDDLESEX
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PHASE SHIFTING TRANSFORMER

This instrument provides convenient means for adjusting the phase angle or power factor in alternating current circuits when testing single or polyphase service meters, wattmeters, or power factor indicators, etc. It is also the simplest means for teaching and demonstrating Alternating Current Theory as affecting phase angle and power factor.

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wash boilers
new editions of
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VERSCO SQUARE BOILER

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VERSCO SQUARE DE LUXE BOILER. This smart and compact boiler is fitted with castors for easy movement and is finished in cream stove enamel. The table-top in cream vitreous is an attractive feature.

VERSCO ROUND BOILER. Obtainable in Galvanised finish as shown (a most durable finish of special appeal for Corporation and other housing schemes) or in cream stove enamel.

THESE FEATURES ARE COMMON TO ALL VERSCO MODELS: Heavily tinned 10 GALLON copper container —Double pole 3 heat rotary switches A.C. or D.C. (safety cut-out available if required)—Chromium plated taps with heat-resisting handles—Six 500 W clamp-on elements give maximum loading of 3 Kw.—Top surrounds in die-cast aluminium and pressed aluminium loose lids for easy access.

Send for new leaflet giving full specifications and prices.

SWIRLUX WASHING MACHINES

500H MODEL heats the water, 6 lb. dry weight capacity, 12" wringer which folds down when not in use. Exclusive Swirlux agitator. (Unheated version 500 MODEL also available.) 503 MODEL— 10/11 lb. dry weight capacity, full size power wringer with five working positions. Exclusive Swirlux agitator. Power pump and hose for quick emptying. For full details send for Swirlux Leaflets.

Universal Boilers & Engineering Co. Ltd., Fulledge Works, Burnley, Lancs.
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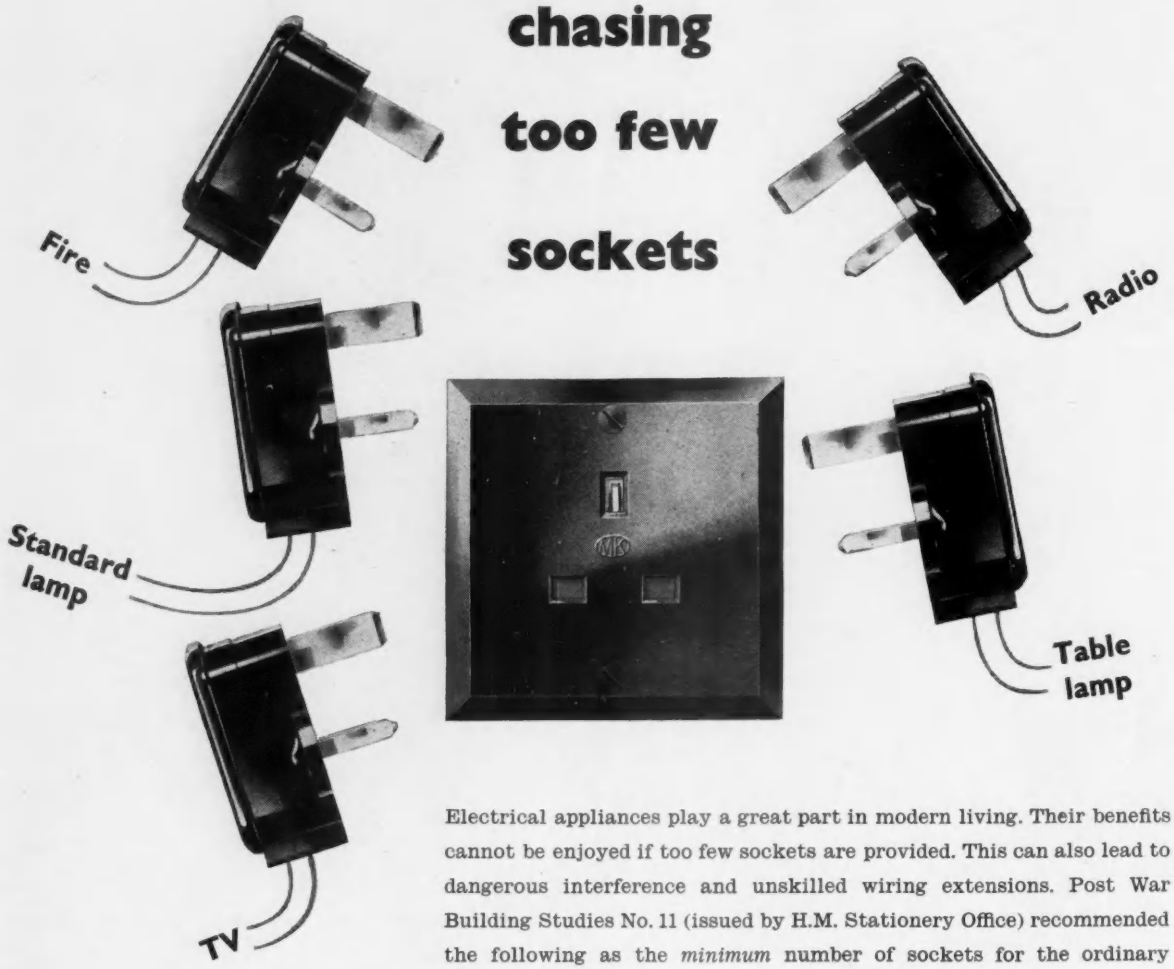
Too many plugs chasing too few sockets



Electrical appliances play a great part in modern living. Their benefits cannot be enjoyed if too few sockets are provided. This can also lead to dangerous interference and unskilled wiring extensions. Post War Building Studies No. 11 (issued by H.M. Stationery Office) recommended the following as the *minimum* number of sockets for the ordinary small dwelling.

LIVING ROOMS	3	
DOUBLE BEDROOMS	3	
SINGLE BEDROOMS	2	
KITCHENS	3	(2 *if not intended for use as a living room*)

Our advice on accessories for ring-circuit wiring is freely available

MK ... the mark of safety

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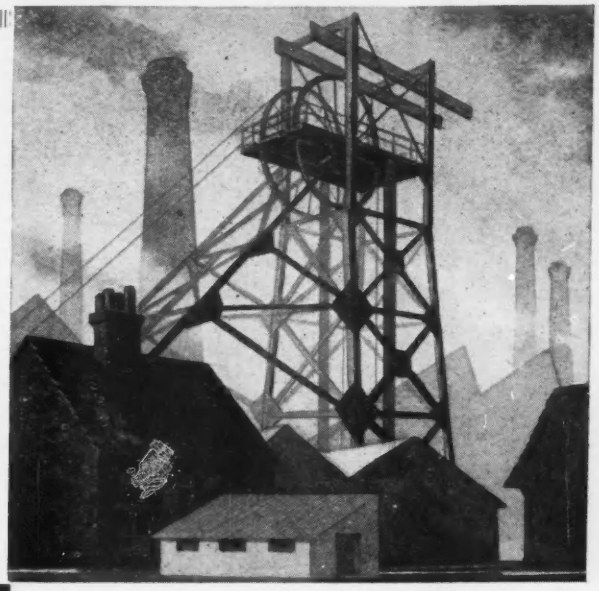
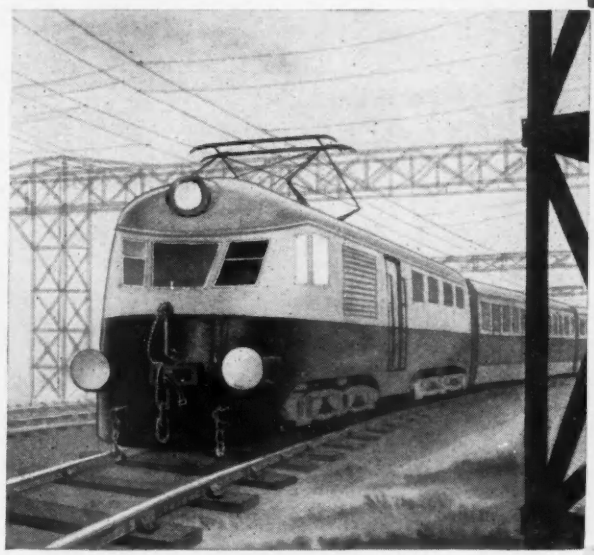
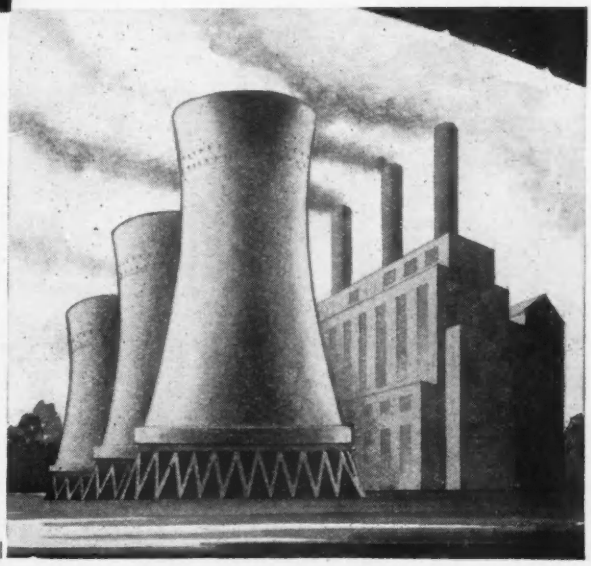
Current problems solved!





Behind the solution to "current" problems stand fifty-eight years of research and practical application in the field of cable construction. Well known to engineers for their superb performance and reliability, CONNOLLYS Paper Insulated Power Cables have "grown-up" with the mighty giant of Electric Power. Many Area Electricity Boards, Collieries and Railways rely on the safe enduring qualities of CONNOLLYS Cables knowing that in our modern factory we, ourselves, carry through every stage of manufacture from wire-drawing, to final testing. CONNOLLYS Paper Insulated Power Cables are produced to British Standards and other specifications from 660 to 11,000 volts. Special finishes can be manufactured to customers own requirements.

Founder members of the C.M.A.



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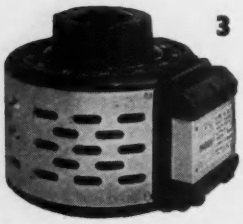
3 New Components
FOR THE ELECTRONICS INDUSTRY

1


3

2

1 Bercostats. A new range of power rheostats for industrial electronics. 5 sizes from 25 to 150 watts. All ceramic construction. Windings embedded in vitreous enamel giving great mechanical strength. Finishes comply with RCS.1000. Available in open, protected and ganged models.

2 A range of 3 moulded knobs with collet fitting (Patent applied for) ensuring positive grip of circular shafts. Quickly and easily fixed and removed. Interchangeable collets for ¼", ⅜" and ½" shafts.

3 Berco Rotary Regavolt Variable Transformers. Two additions to the range of well known " Regavolt " regulating transformers, but of rotary type, for 200/250 volt supplies, ratings 0·8 and 2 amps respectively. Compact, smaller than any other transformer of comparable rating. Suitable for panel mounting.

* *See these and our wide range of high quality electronic components including: Hermetically sealed potentiometer, fully Type Approved to Class H.I. of RCS. 121. Vitreous enamelled resistors, also Type Approved to Class H.I. of RCS.111.*

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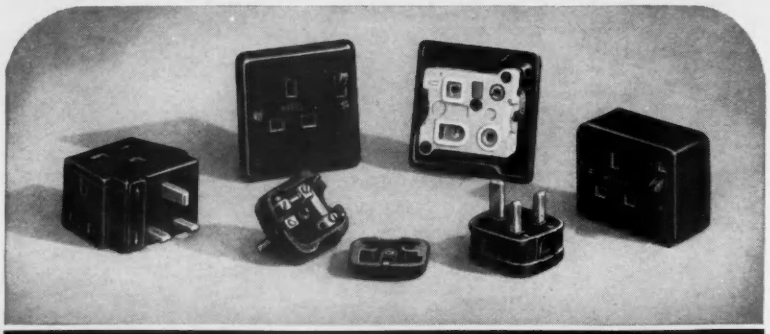
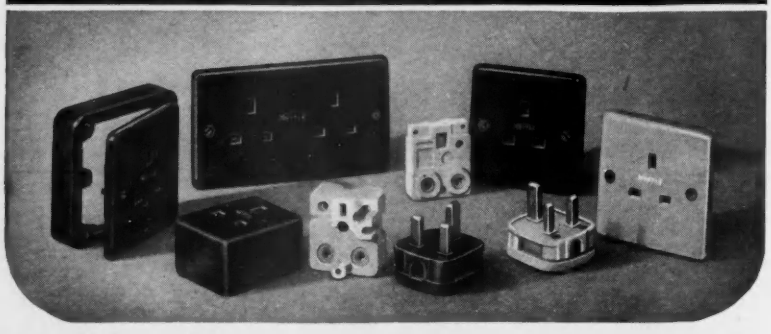
SETTLE for NETTLE



13 Amp. RING MAIN SOCKET OUTLETS & PLUGS



ALL NETTLE 13 Amp. Socket Outlets have a porcelain base and are manufactured strictly in accordance with B.S.S. 1363. The Flush Fitting Switch Socket Outlet, Ref. S.F. 1230 (top centre) will accept plugs to B.S.S. 1363 and can be mounted directly on to a B.S.S. 1299 box. The Switch is for A.C. use only and has silver contacts.

A copy of the NETTLE Catalogue containing over 200 items will be sent upon request.

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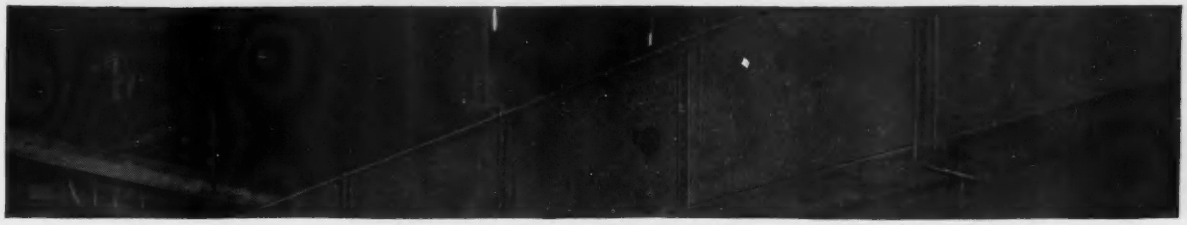

Up goes efficiency with the "L" type stoker

There is a highly efficient 'L' type stoker to suit every known design and size of water tube boiler.

- *Close control of air supply*
- *Automatic cleaning of grate surface*
- *Efficient burning of fuels with widely differing characteristics*
- *Very little maintenance required*

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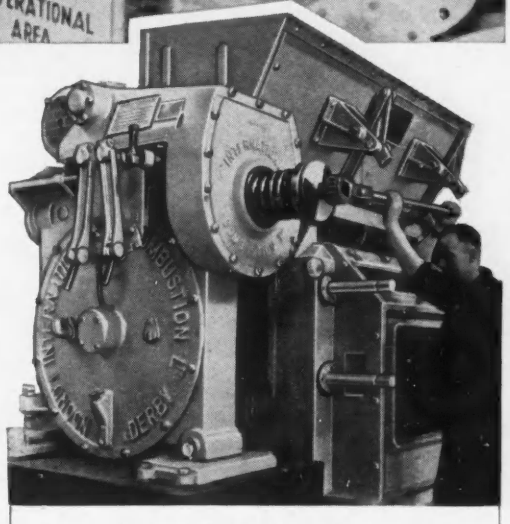


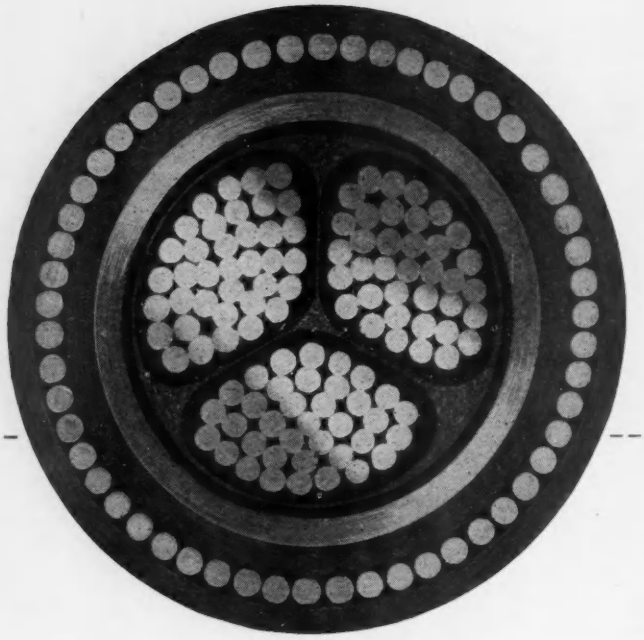
Top. A large 'L' type stoker with twin travelling grate during installation.

Below: Hand operation of small 'L' stoker grate during erection.

C13

SIEMENS CABLES

With P.V.C. Protection overcome corrosion problems



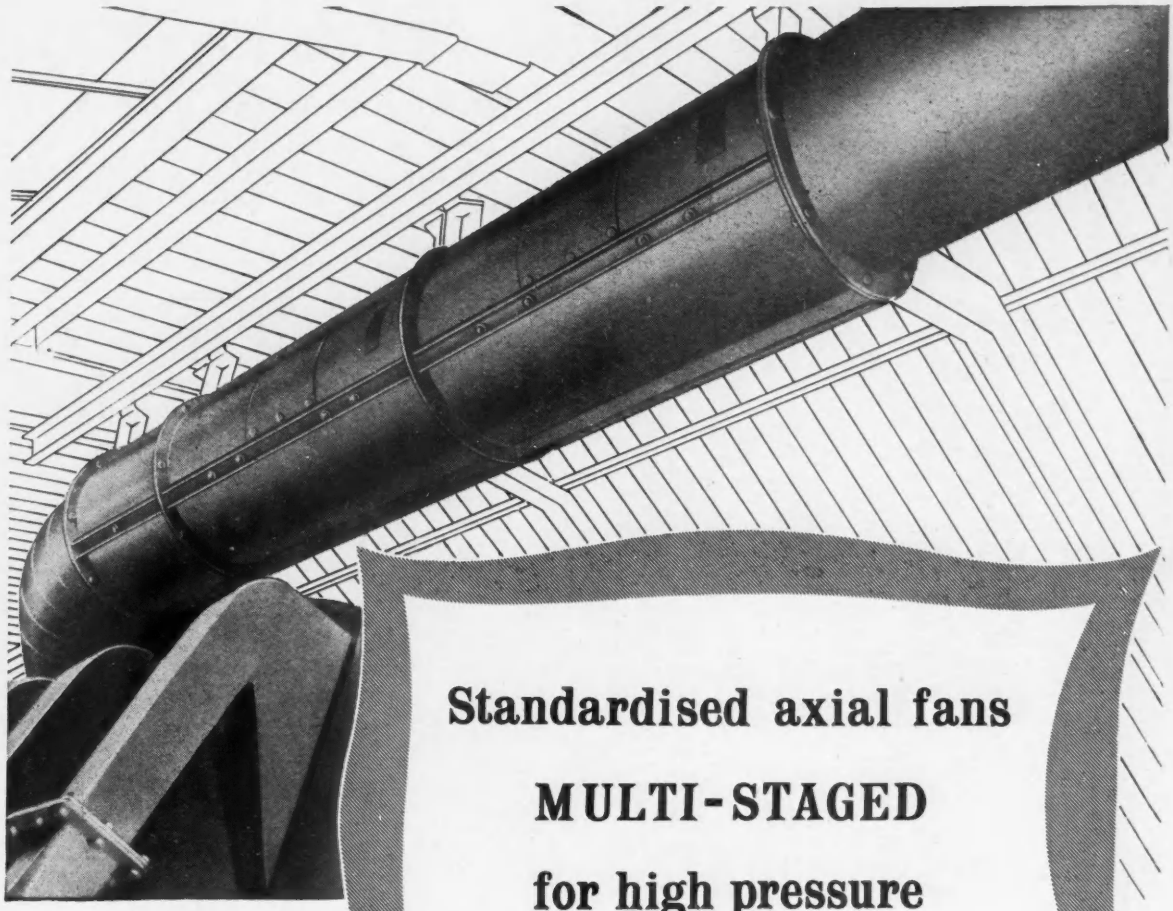
Power cable with P.V.C. sheathing under and over the Armour wires

P.V.C. protects power and telephone cables from elements likely to cause corrosion. It is mechanically strong, resistant to abrasion and is unaffected by soil compounds. It is non-inflammable, does not deteriorate markedly with age and so protects thc cable throughout its working life. Suitable for all cable diameters. All enquiries are welcome.

SIEMENS BROTHERS & CO. LIMITED

Woolwich, London, S.E.18.

Telephone : Woolwich 2020



Standardised axial fans MULTI-STAGED for high pressure

Simply by bolting standardised Woods *Aerofoil* fans together in series you can obtain pressures hitherto achieved only by centrifugal fans. Multi-stage contra-rotating *Aerofoil* fans can be offered for pressures of 20″ s.w.g. or more. See how the 5-stage fan illustrated is 'lost' in the run of ducting. Woods *Aerofoil* fans are usually more compact, lower in first cost, and consume less current than the centrifugal type.

The Woods fan engineer in your area will be pleased to call. Write for publication V1089

WOODS for Fans

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An associate company of The General Electric Company Ltd.

The CRW2.
A very sensitive lever-actuated switch requiring ¼-1 oz. force to operate.

There are operations in industry which demand activation or immediate stoppage by a switch which will respond to the lightest touch. BURGESS make such a switch—the CRW2.

They also make Micro-Switches for almost every other purpose.

PLEASE CONSULT OUR CATALOGUE 50/8

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MICRO-SWITCHES
Industry's Automatic Choice

Burgess Products Company Limited
Micro-Switch Division
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Frequency Meters up to 5,000 cycles

A new E.I.C. Synchroscope
In-Phase Current Meters (I x cos ϕ) and all normal Switchboard and Portable instruments.

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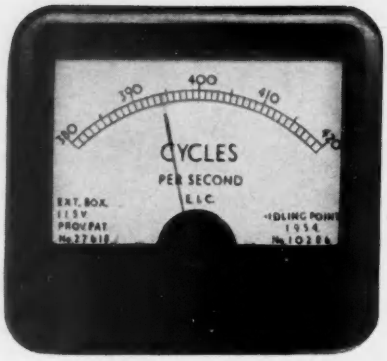

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Sizes : 2½" to 8"

ELECTRICAL INSTRUMENT CO. (Hillington) Ltd.
Boswell Square, Hillington, Glasgow, S.W.2
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GILFLEX

FARM & INDUSTRIAL PLASTIC CONDUIT *WIRING SYSTEM*

★ ALL-INSULATED ★
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★ WATERTIGHT ★

GILFLEX CONDUITS LTD
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WHY PERSPIRE?

Even after fifty years there must be someone who could use a **BROOK** electric motor to do the harder work in his factory, mill, or even in his home, to mention but a few of their possible applications.

What sort of motor should you use? Brook technicians will advise you on the most suitable types of motor, with control gear to match. There is no better way of ensuring that you can let the maintenance man have his holidays.

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The CRW2.
A very sensitive lever-actuated switch requiring ¼-1 oz. force to operate.

There are operations in industry which demand activation or immediate stoppage by a switch which will respond to the lightest touch. BURGESS make such a switch—the CRW2.

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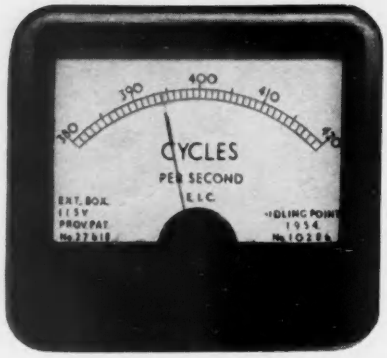

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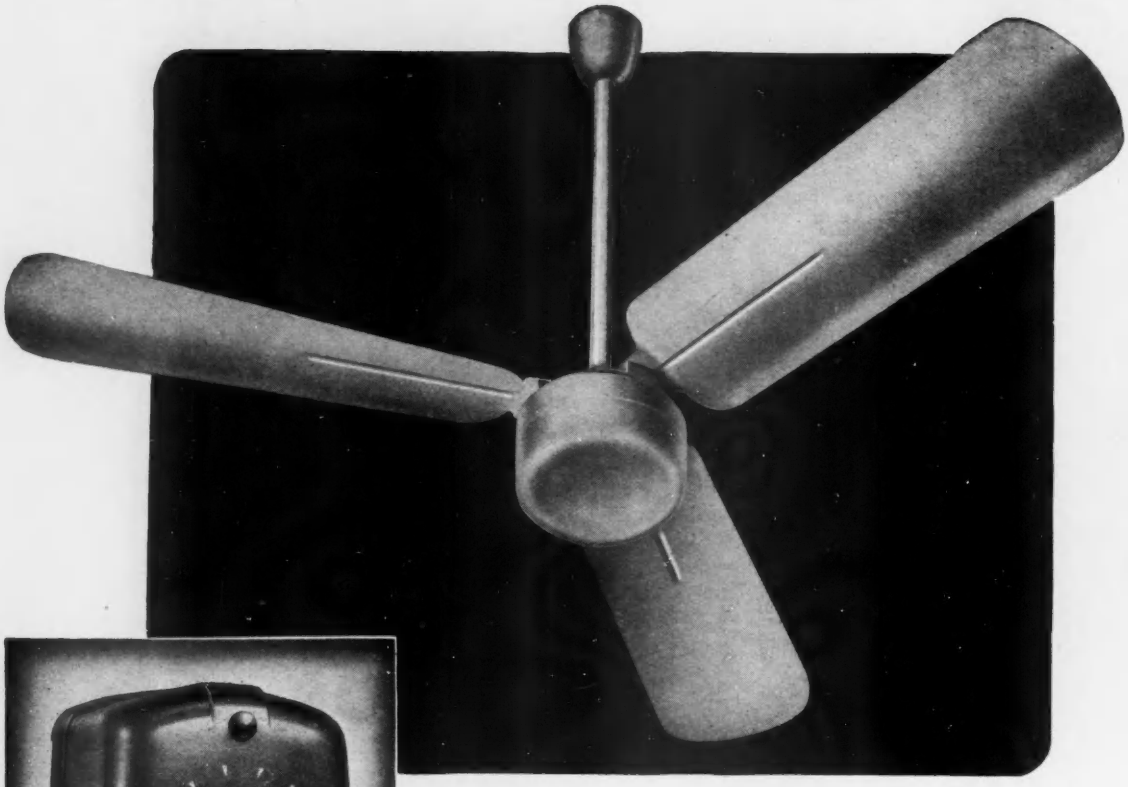
Used throughout the B.E.P.C. Exhibition . . .



REVO REGD.

"Ariel" CEILING FANS

At this year's British Electrical Power Convention at Eastbourne, Revo "Ariel" Ceiling Fans were selected for use throughout the Exhibition Hall.

The Ariel Fan is the latest addition to the wide range of Revo Fans designed to withstand continuous use under the most severe climatic conditions; models with either 56 in. or 60 in. blades are available and may be supplied with a five-speed regulator as illustrated.

Revo, Ceiling, Desk, and Cabin Fans are in use extensively both at home and abroad and large numbers have been installed on ships for British and overseas owners.

REVO ELECTRIC CO. LIMITED, TIPTON, STAFFS, ENGLAND

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Makers of Electric Cookers, Domestic Appliances, Public and Industrial Lighting, Switchgear, Fans

Deflection without defection

When the Crompton Parkinson 'Tong-Test' first made its bow, it soon gained a reputation for its accuracy. At full-scale deflection this is ± 1 per cent — a higher degree of accuracy than to be found in any other similar instrument. This sort of precision is the result of individual calibration of each separate 'Tong-Test' dial and is an inherent characteristic of every measuring instrument we make.

NOTE TO STOCKISTS. Movements can be interchanged between different 'Tong-Tests', but this means the sacrifice of high accuracy. Would you like free details?

When it comes to ELECTRICAL INSTRUMENTS . . .

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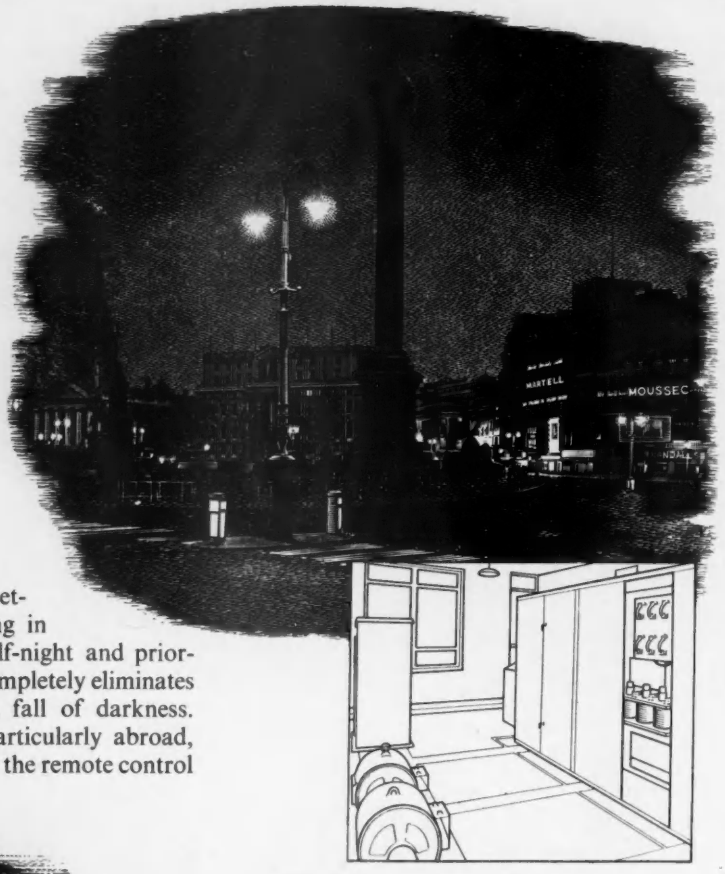
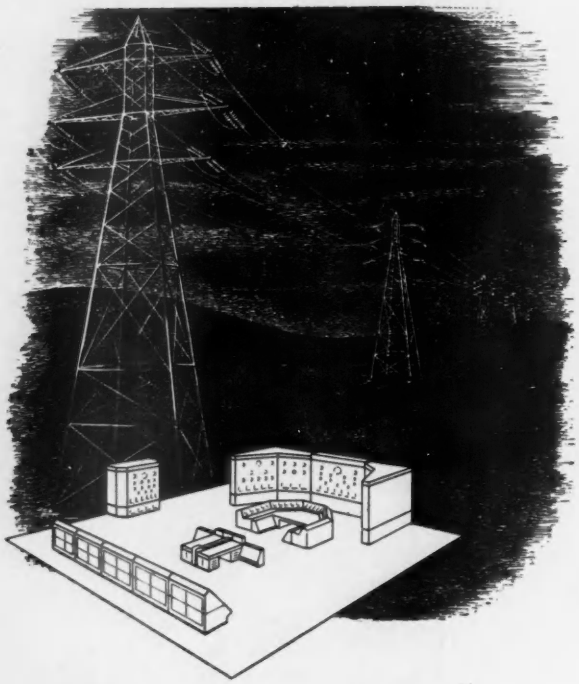
These CONTROLS benefit the citizen



A.T.E. Rythmatic Ripple Control for street-lighting—as employed to control lighting in Trafalgar Square—provides all-night, half-night and prior-dawn switching from a central point . . . completely eliminates the dangers consequent upon a sudden fall of darkness. "Rythmatic" equipment is also used, particularly abroad, with considerable economy and success for the remote control of water heaters.



A.T.E. RYTHMATIC RIPPLE CONTROL EQUIPMENT

A.T.E. Supervisory Remote Control for the super-grid will assist in maintaining the effective control of generation and transmission that is vital to efficiency in the largest integrated electricity distribution network in the world . . . serving a population of nearly 50 millions.

A.T.E. SUPERVISORY REMOTE CONTROL EQUIPMENT

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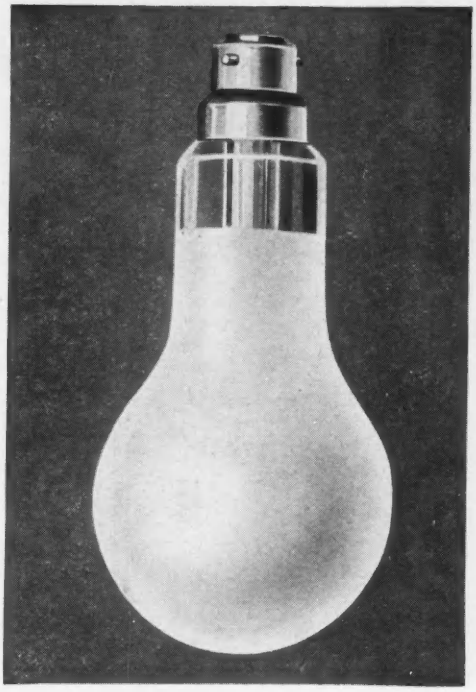
Phone: TEMple Bar 4506. Grams: Strowger, Estrand, London, Strowger Works, Liverpool 7.

AT 3821-A23

Remarkable advances in Discharge Lamp performance

Osram LAMPS

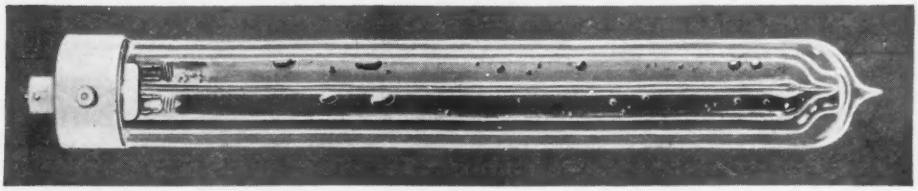


FOR STAMINA

MERCURY LAMPS

Ever since the first high pressure mercury street lighting installation in the world, erected by the G.E.C. in Wembley in 1932, Osram Mercury lamps have been unsurpassed in quality. The latest development is an entirely new fluorescent powder for the 80 and 125 watt sizes which gives much improved colour rendering and better lamp appearance. Particularly suitable for side street lighting and for many industrial applications.

SODIUM LAMPS Research into the fundamentals of OSRAM Sodium lamp design has resulted in important improvements — giving much better performance. New techniques developed by Osram engineers which are principally concerned with the structure of the cathodes and the method of ensuring a high degree of purity of coating have vastly improved the stamina and reliability of OSRAM Sodium lamps.



A G.E.C. PRODUCT The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

This power transformer really is "on the wagon"

Our wagon carries Standard Transformers to the B.E. Specification T.1., and "specials" This one is a "special," it is a 1000 kVA 3/2 phase 11,000/2,200 volts.

Whether standard or special, each Transformer receives special attention to the sober things that really matter in transformer construction.

A "tailor made" job at a reasonable price.

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GRAPHIC RECORDER

★ for accuracy
★ speed of response
★ exceptional sensitivity
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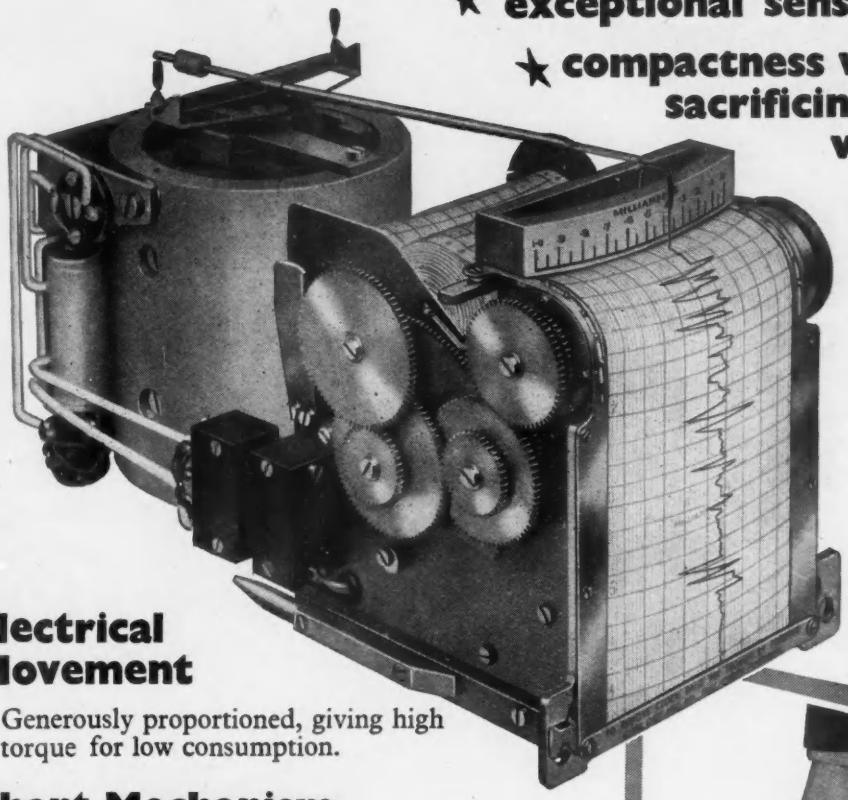


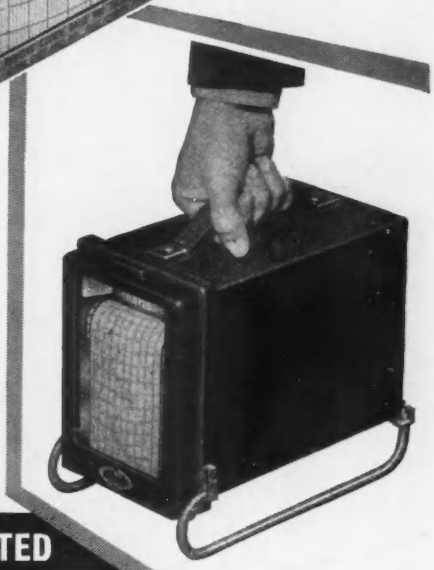
Electrical Movement

Generously proportioned, giving high torque for low consumption.

Chart Mechanism

Compact, removable without disturbing the electrical movement and can be re-loaded with ease and safety.

Available over the full range of power requirements and tachometers. Also available in special forms for telecommunication and electronic service. Standardised designs available for quick delivery.



THE RECORD ELECTRICAL COMPANY LIMITED

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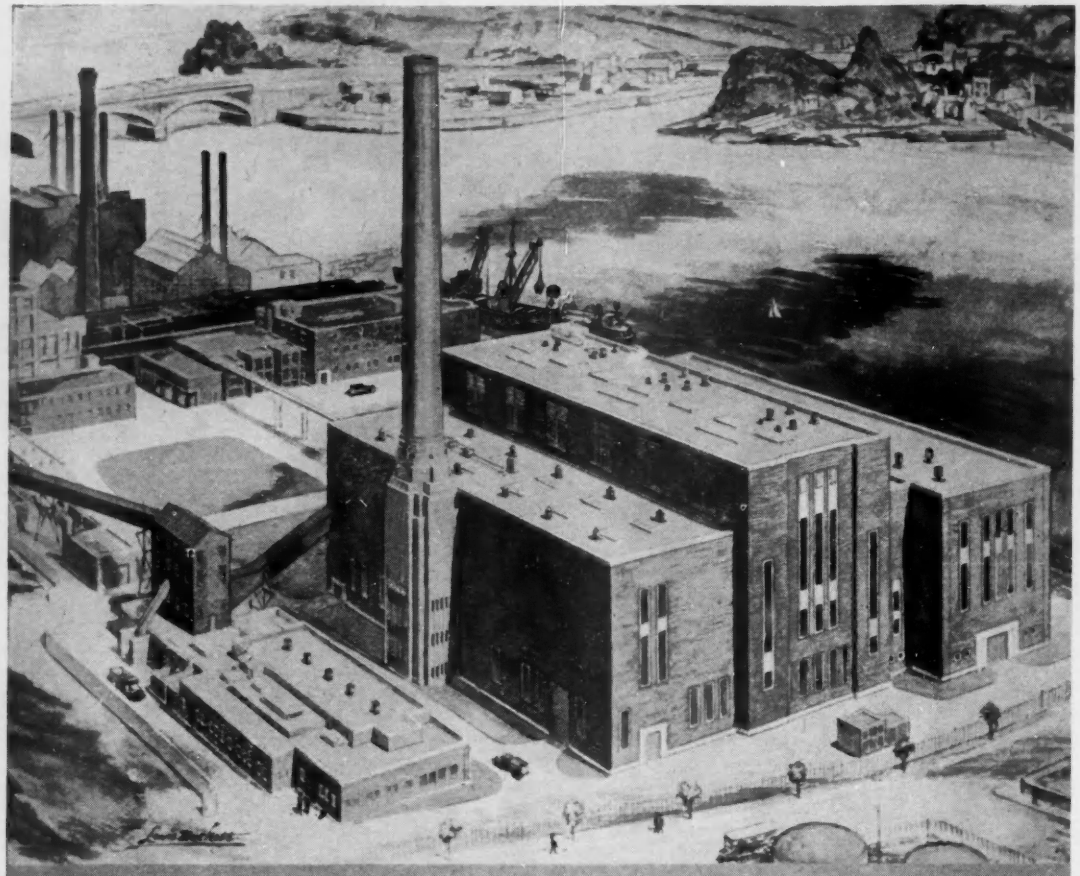
Telephones : ABBey 5148 and 2783 *Telegrams:* Circscale, Sowest, London *Cables :* Circscale, London



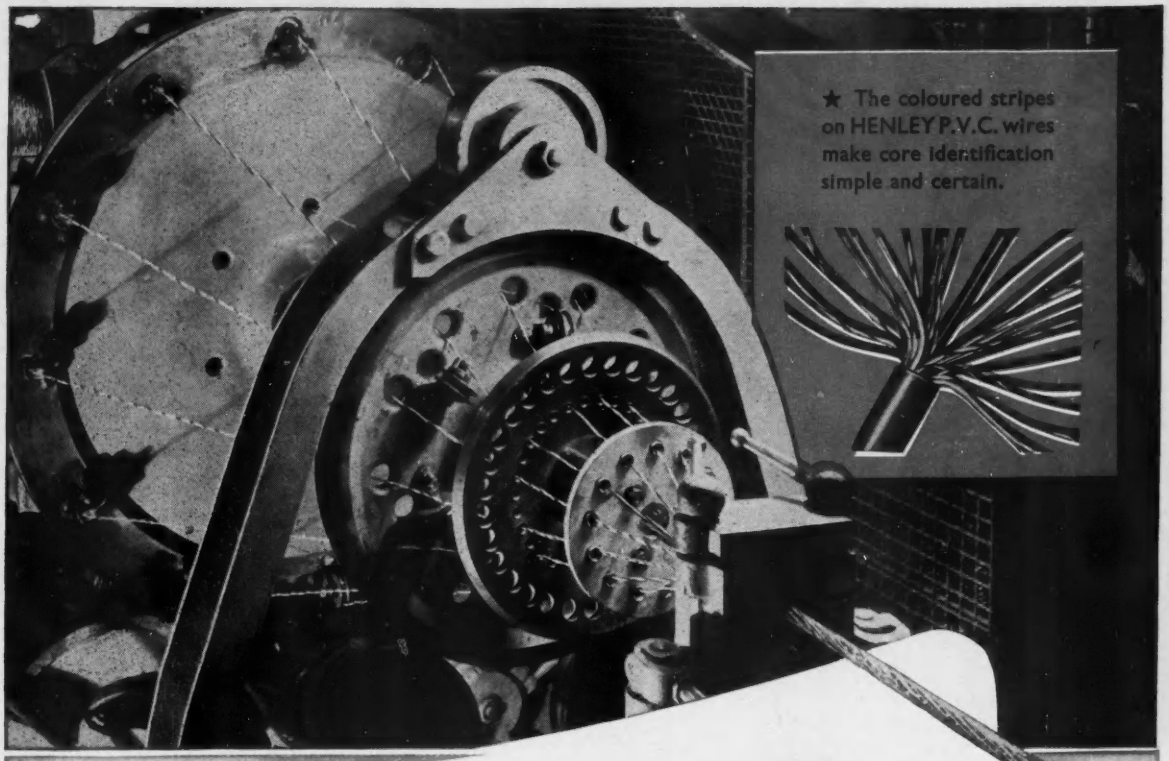
Plymouth 'B' Power Station

YARROW BOILERS

YARROW

and Company Limited

SCOTSTOUN · GLASGOW · W.4



★ The coloured stripes on HENLEY P.V.C. wires make core identification simple and certain.

HENLEY

THERMOPLASTIC WIRES and CABLES

Henley's manufacture a very comprehensive range of wires, cables and flexibles insulated with P.V.C. and Polythene for Telecommunications, High Frequency, Television Down Leads, Equipment Wires, etc. Where colour identification of cores is required, the Henley dual marking method provides an extremely wide range of colour combinations. If you have a problem concerning thermoplastic cables Henley's advice is readily available.

★ Ask for Folder 484 describing HENLEY Colour Striped P.V.C. Wires

BY APPOINTMENT ELECTRIC CABLE MANUFACTURERS

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

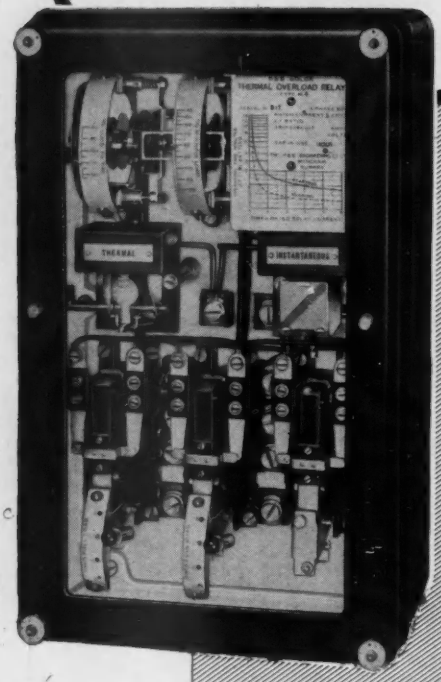
C

PROTECT

YOUR MOTORS

with

P & B Golds' Relays



For motors with long starting periods or starting currents under extremes of ambient temperature.

Send for descriptive pamphlet.

THE P&B ENGINEERING CO · LTD
CROMPTON WAY · CRAWLEY · SUSSEX
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We specialise

IN THE DESIGN OF

TRANSFORMERS

TO SUIT

INDIVIDUAL REQUIREMENTS

EXACTLY TO SPECIFICATION

(UP TO 20 kVA)

A.I.D. APPROVED

PROMPT AND REGULAR DELIVERIES

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A Quality Product from

THE MIDLAND COIL WINDING COMPANY LTD.

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AND NOW

- **PRE-PACKAGING TO ALL MINISTRY (A.I.D., I.F.V. ETC.) REQUIREMENTS**

'This is in addition to our well established commercial packing and case-making business. DELIVERIES ARE GUARANTEED.'

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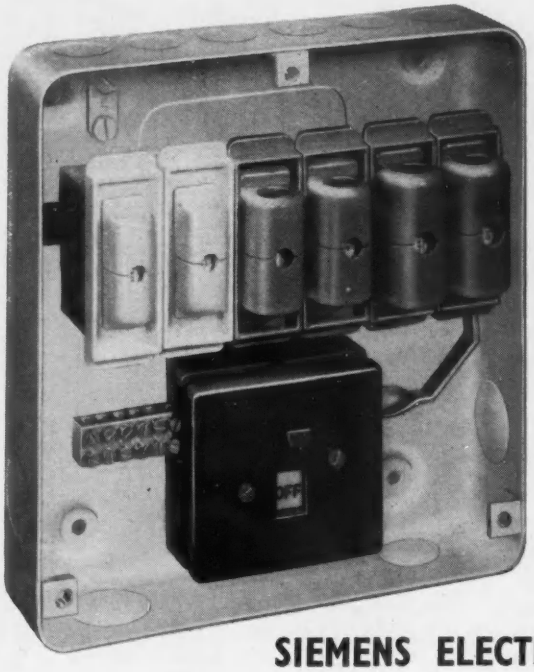
SIEMENS 'NEWTYPE'

Consumer Service Unit



METALCLAD AND INSULATED PATTERNS
4-WAY, 5-WAY AND 6-WAY

These consumer units are a scaled-down version of our popular F 3081 8-way units. Every consideration has been given to provide ample wiring space and easy wiring facilities. Unnecessary refinements have been eliminated with a view to providing a high quality efficient consumer unit as low in price as any on the market.

The units are fitted with fuse bases which will accommodate either H.R.C. Cartridge Fuse Carriers or Rewireable type Carriers as required.

CATALOGUE NUMBERS AND PRICES				
NO. OF WAYS	METALCLAD	INSULATED	LIST PRICE WITH H.R.C. FUSES	LIST PRICE WITH REWIREABLE FUSES
			£ s. d.	£ s. d.
4 ways	F 3295/M4	F 3295/B4	3 3 0	2 19 8
5 ways	F 3295/M5	F 3295/B5	3 5 0	3 0 10
6 ways	F 3295/M6	F 3295/B6	3 7 0	3 2 0

DIMENSIONS: Metalclad Height 7⅛″ Width 6⅞″ Depth 3½″
Insulated Height 7⅞″ Width 7½″ Depth 3¼″

SAFE · FOOLPROOF

EASY WIRING · LOW PRICED

Illustrated leaflet No. 107/54 will gladly be sent on request.

SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED

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How does production grow?.....

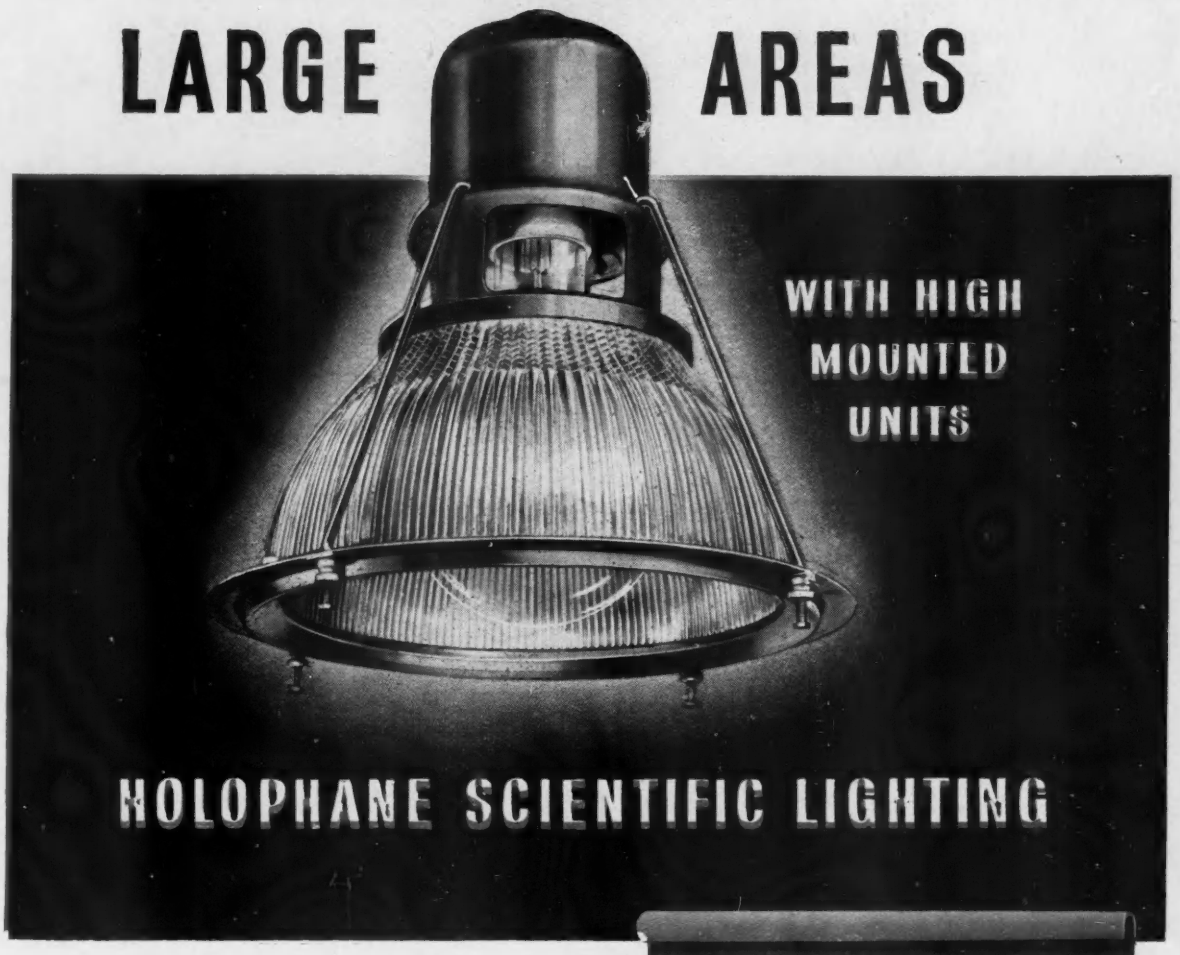
.... with Busy Bees all in a row

Some factories have rows of "Busy Bees" working for them—some have only one. But all agree they keep the wheels turning and production growing. And if you didn't know already, "Busy Bees" is the "nom de plume" of G.E.C. Fractional Horse Power Motors. As if they needed any disguise!

G.E.C. Fractionals

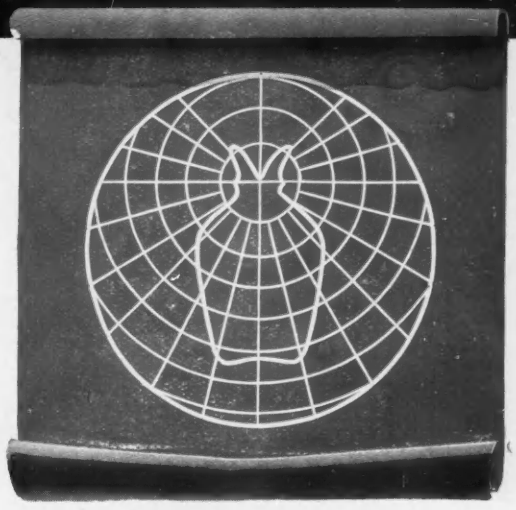
THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

ILLUMINATING LARGE AREAS



The Holophane system utilises the prism to control and direct with the utmost efficiency the light where it is wanted.

These heavy duty translucent units have been designed for the illumination of large areas from high mountings, and in addition to providing the maximum light in the working area, they direct light upwards without any loss to the downward efficiency, thereby avoiding "tunnel" effect in lofty interiors.

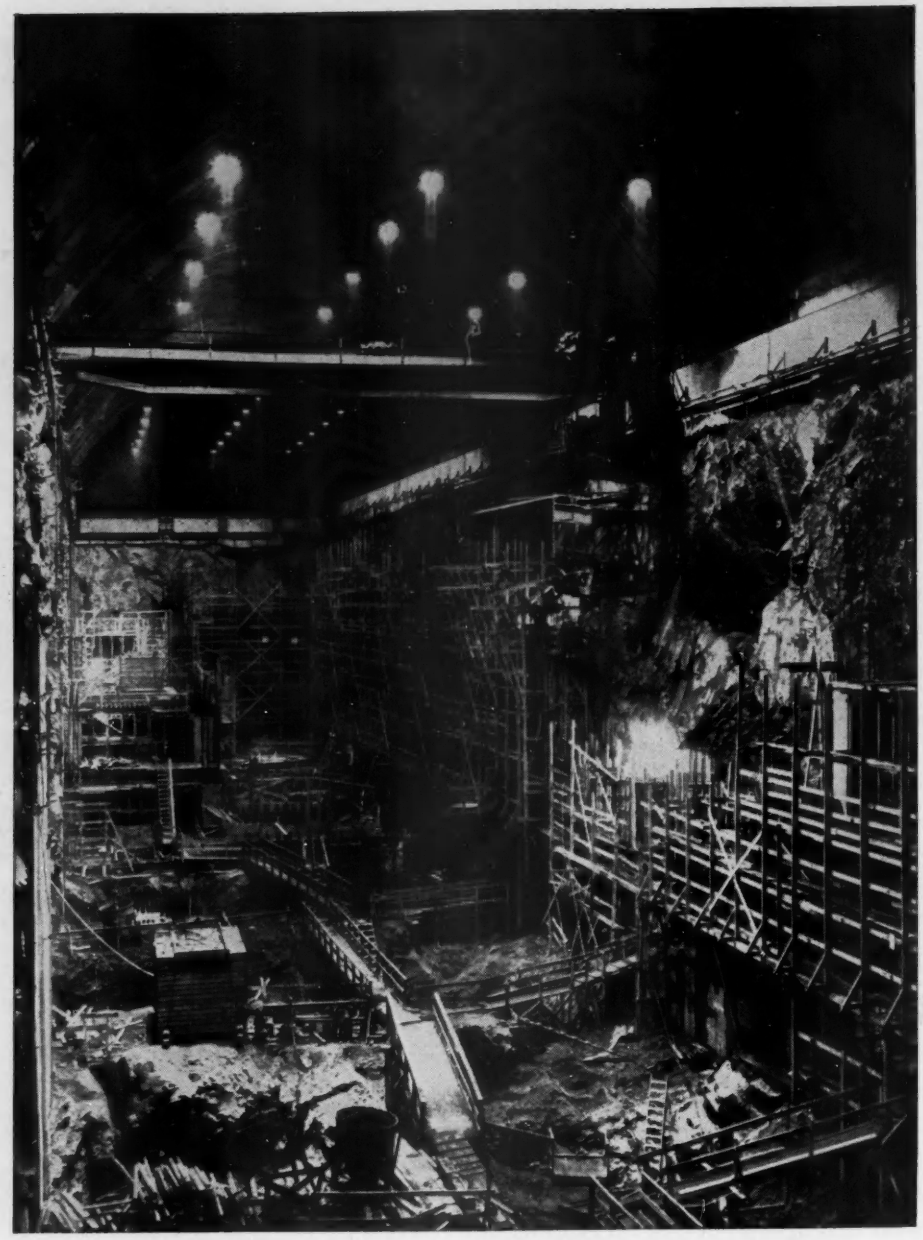


HOLOPHANE LIMITED

SCIENTIFIC ILLUMINATING ENGINEERS

ELVERTON STREET, WESTMINSTER, LONDON, S.W.1 Phone: VICtoria 8062 Grams: Holophane Sowest London

aluminium adventure



powerhouse inside a MOUNTAIN

Excavated inside the heart of Mount Du Bose, British Columbia, this huge man-made cavern will eventually house 16 hydro-electric turbines and generators, with a total capacity of over 2,000,000 horse power.

Already, on the other side of the mountain range, the water level is gradually rising in a 350 square-mile storage reservoir of rivers and lakes, formed by reversing an entire river system. The water will flow into a 10-mile tunnel drilled through the mountain and plunge 2,585 vertical feet—16 times the height of Niagara—to drive the turbines of the Kemano underground power house.

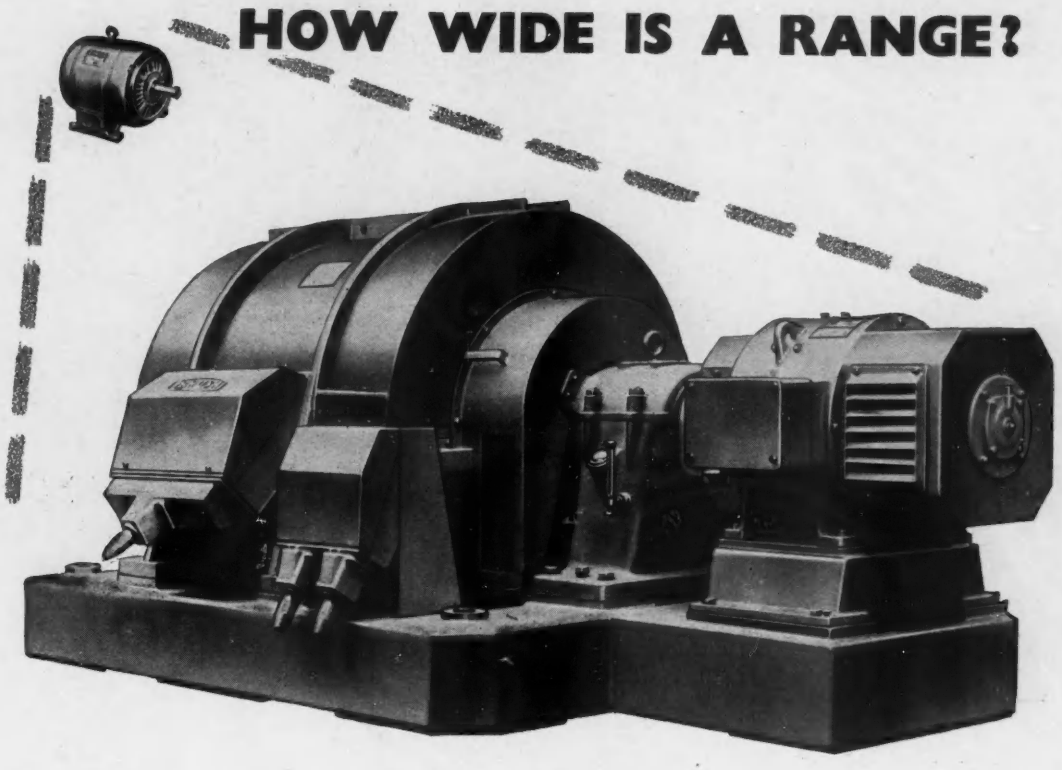
From Kemano, a 50 mile transmission line will carry the power across rocky terrain and over a 5,300 ft. mountain pass to the great new smelter of Aluminum Company of Canada Ltd., at Kitimat—capable when fully developed of producing 500,000 metric tons of Aluminium a year for the markets of the world.

Aluminium Union Limited

Incorporated in Canada

THE ADELPHI, STRAND, LONDON, W.C.2. AN ALUMINIUM LIMITED COMPANY
PRINCIPAL BRITISH COMMONWEALTH DISTRIBUTOR OF ALUMINIUM

HOW WIDE IS A RANGE?



...it's from one to 3,000 horse power

What does that mean? It means that if your electric power requirements fall anywhere between 1 h.p. and 3,000 h.p. there is a choice of Brush motors to supply them. Within this range it is possible to meet every familiar need—and many needs that are not so familiar. Brush motors are built to work anywhere, to stand up to anything. The secret of this reliability lies in the rigid rules of quality that govern every stage of production. But there is nothing rigid about your choice of types: industrial—flameproof—squirrel cage or slipring—synchronous or synchronous-induction . . . Brush make them all, including special 60-cycle machines for U.S.A. and Canada to conform with NEMA and CSA standards. Let us know which part of the BRUSH range concerns you so that we can send you the full information.

Electric motors

from 1 h.p. to 3,000 h.p. by BRUSH

BRUSH ELECTRICAL ENGINEERING CO. LTD • LOUGHBOROUGH, ENGLAND

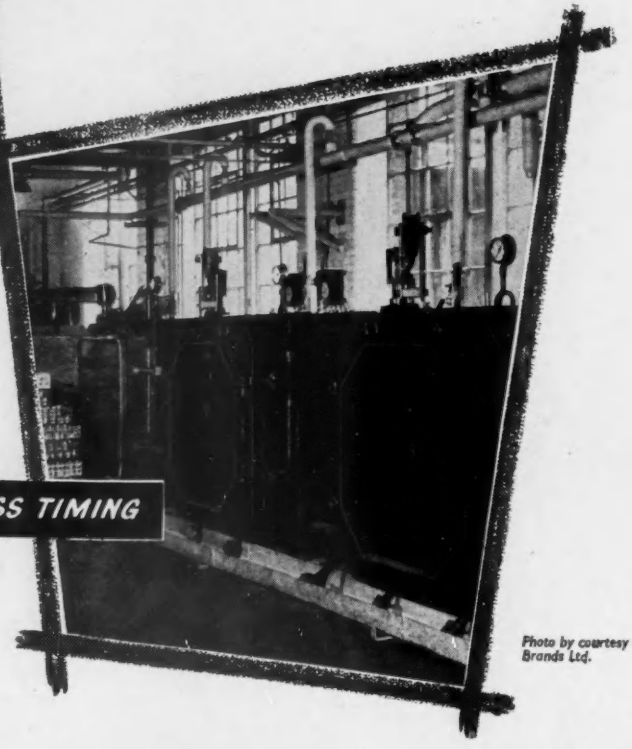
Birmingham · Bristol · Cardiff · Glasgow · Ipswich · Leeds London · Manchester · Newcastle · Sheffield 834

STREET LIGHTING

Photo by courtesy of Crompton Parkinson Ltd.

Automatic

EGG PRODUCTION



PROCESS TIMING

Photo by courtesy of Brands Ltd.

Electrically wound, synchronous with or without spring reserve, and up to 35 days hand wound Venner Time Switches are in constant use in the factory for process timing, on the highways for lighting control, for flood-lighting prominent buildings, for increasing Winter Egg production and for all heating, lighting and time control applications.

Congregational Church Hertford Heath

TIME CONTROL

Venner Time Switches can be seen serving the community in many widely contrasted applications.

A Venner Engineer will gladly render assistance upon any problem of time control. Why not get in touch with us?

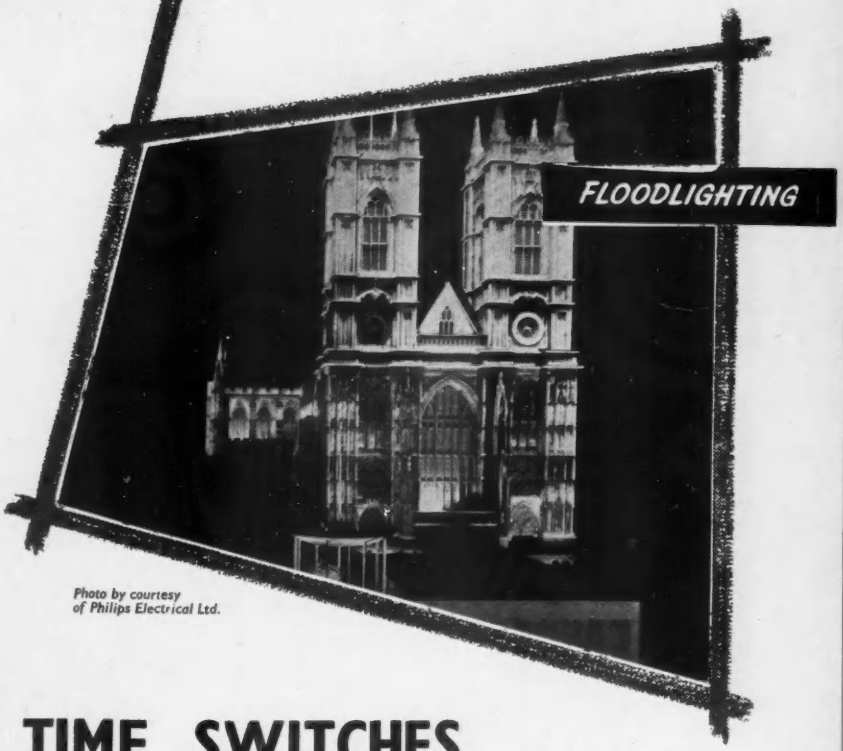


Photo by courtesy of Philips Electrical Ltd.

VENNER TIME SWITCHES

VENNER LIMITED · KINGSTON BY-PASS · NEW MALDEN · SURREY Telephone: MALden 2442 (7 lines)

Associated Companies: VENNER ACCUMULATORS LTD. · VENNER ELECTRONICS LTD.

B T-H

BRITISH STANDARD DIMENSION MOTORS

AVAILABLE FROM STOCK

British Thomson-Houston were among the first to manufacture mechanically-interchangeable motors conforming to B.S.2083. Other makers build to this spec., but the BTH range of totally-enclosed fan-cooled squirrel-cage motors up to 20 h.p. have mechanical and electrical characteristics that are unsurpassed.

THE **BRITISH THOMSON-HOUSTON** CO. LTD. · RUGBY · ENGLAND

Member of the AEI group of companies

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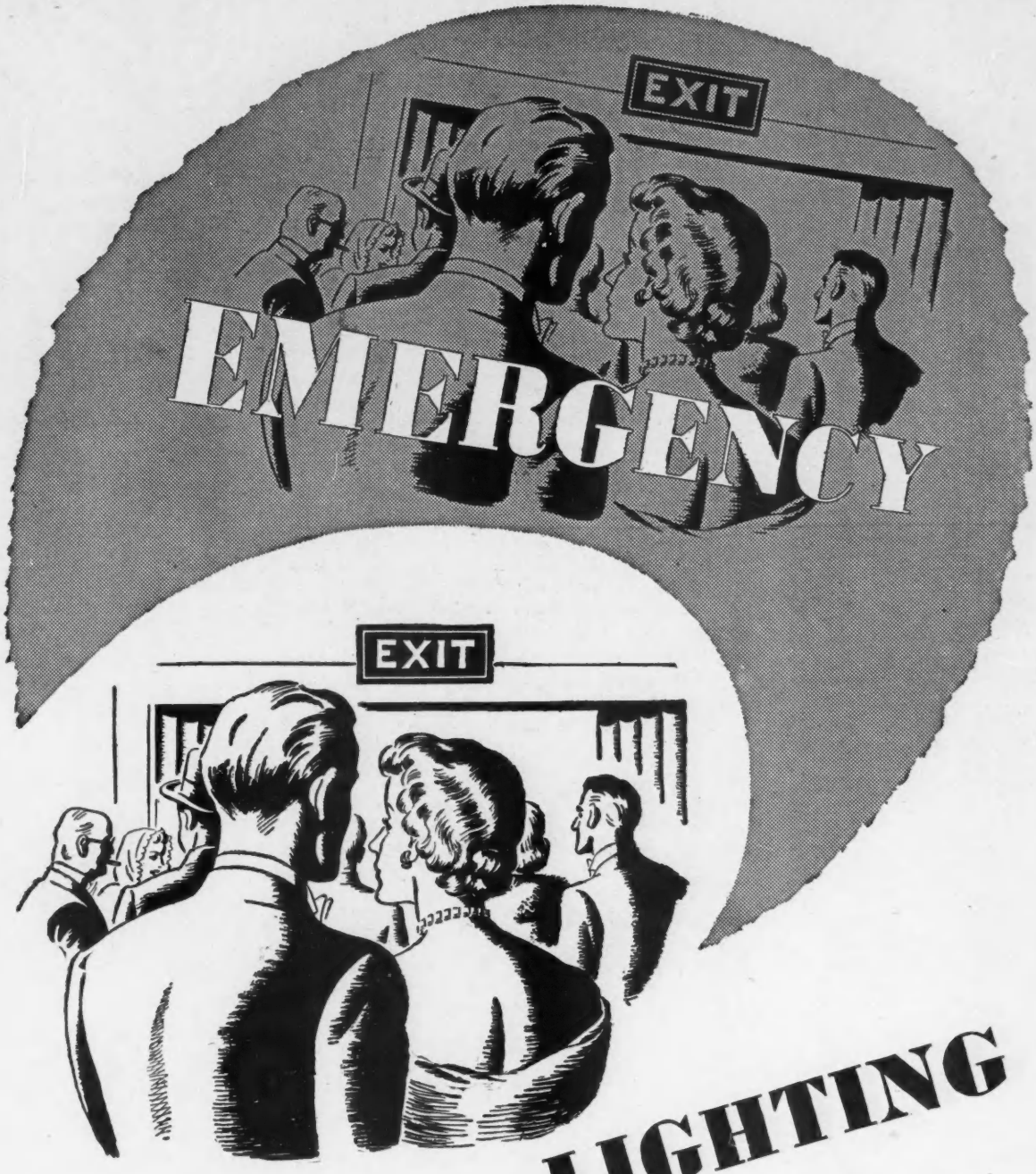
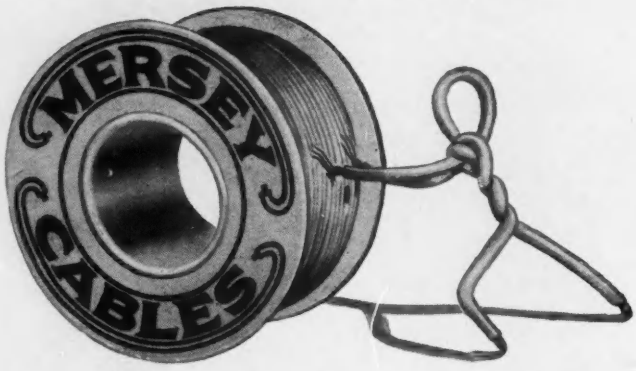


LIGHTING

In public halls and civic assembly rooms the need for emergency lighting is now accepted. In future buildings of this sort the stand by electrical system will be planned at the same time as the main lighting is planned. Chloride Batteries Ltd. makers of Keepalite, the automatic emergency lighting system, offer the advisory services of their engineers to architects and electrical contractors in any part of Britain.

Keepalite
FOR PUBLIC HALLS

A Product of Chloride Batteries Limited, Exide Works, Clifton Junction, Swinton, Manchester and Grosvenor Gardens House, Grosvenor Gardens, SW1 S.73A



THE MARK OF QUALITY

for

RUBBER AND THERMOPLASTIC INSULATED WIRES, CABLES AND FLEXIBLES

MERSEY CABLE WORKS LIMITED

LINACRE LANE · BOOTLE · LIVERPOOL, 20

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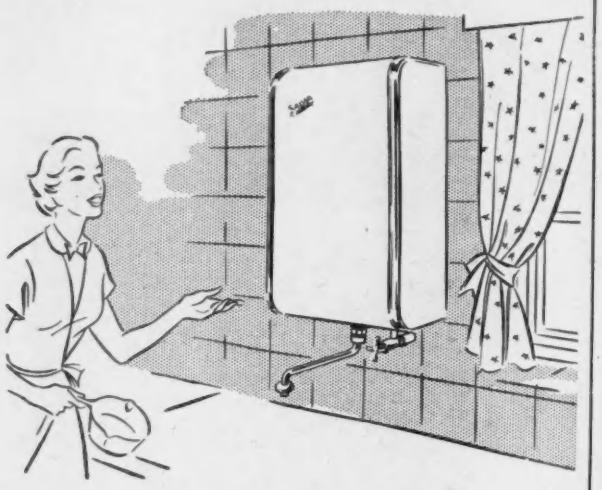

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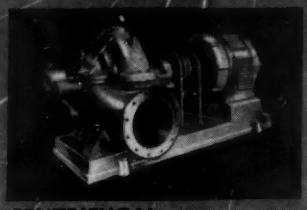

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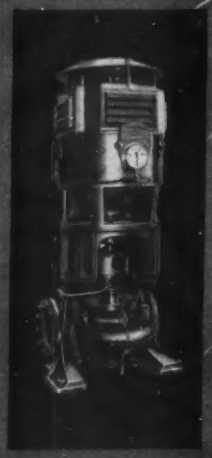

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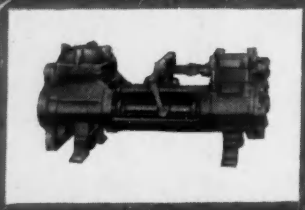

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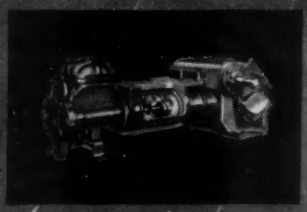

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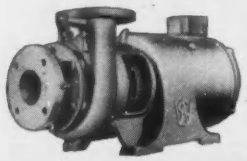

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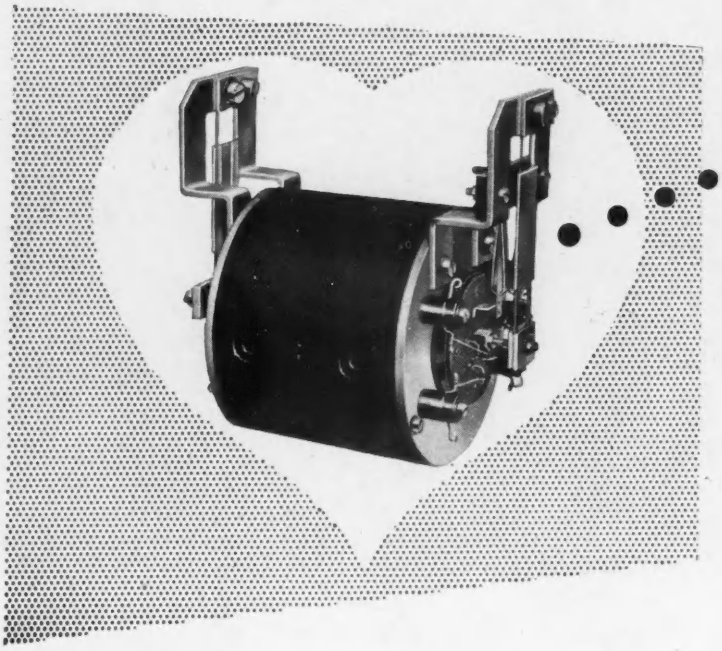

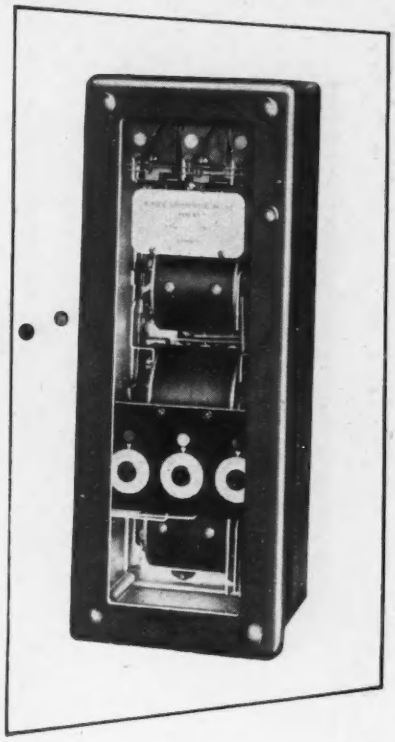

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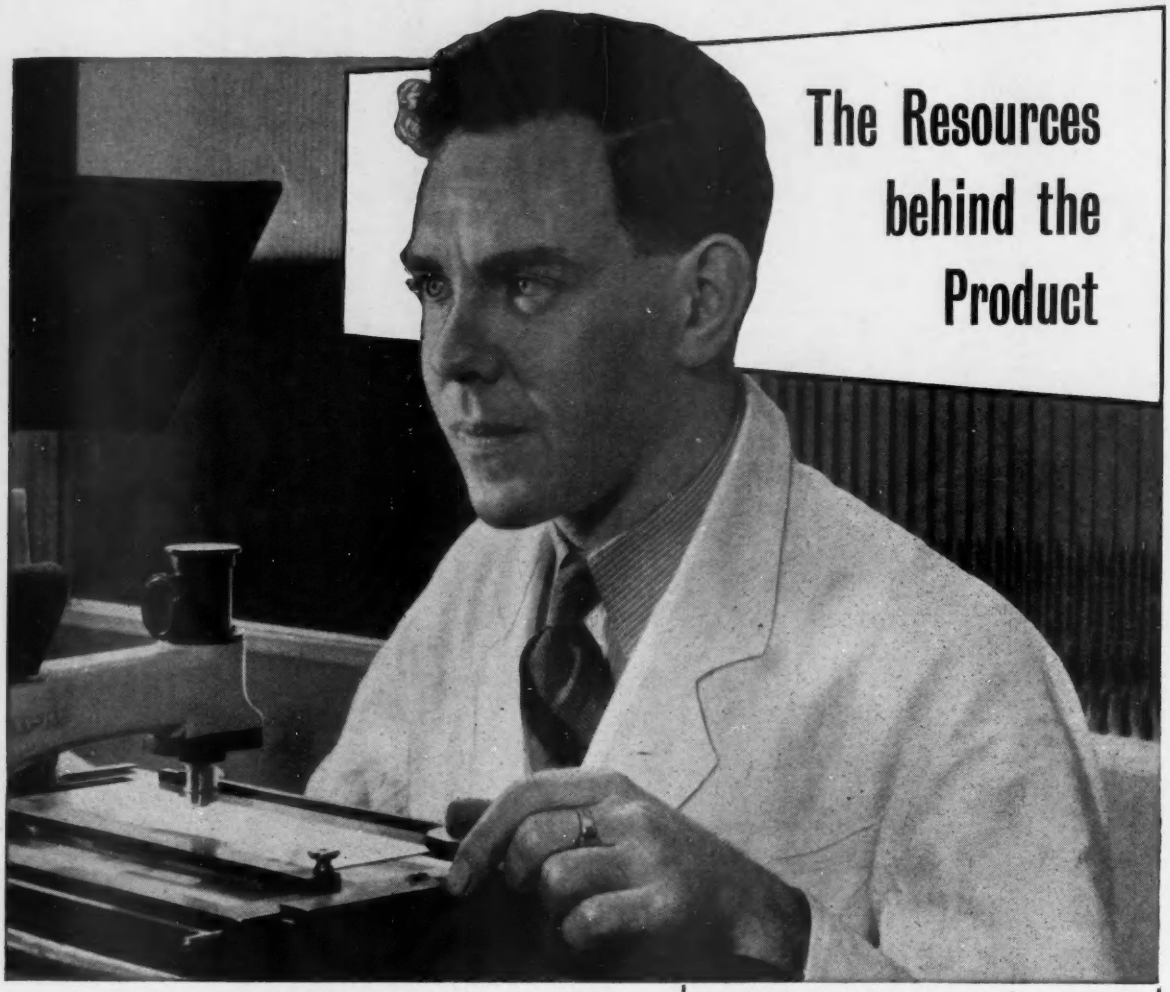

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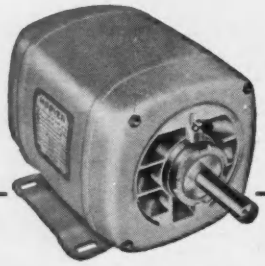

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ELECTRICAL TIMES

THURSDAY, 24 JUNE, 1954
Volume No. 125 Number 3268
REGISTERED AS A NEWSPAPER

ESTABLISHED 1891

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2.
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United Kingdom and Overseas £2. 10s. 0d. per annum. Canada $7.50, U.S.A. $7.50 per annum. Subscriptions are payable in advance and may commence with any issue throughout the year. Overseas subscriptions may be paid to The Electrical Times Limited by banker's draft, cheque or international money order. Single copies price 9d. each.

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E.P.E.A. GIVES NOTICE

Clearly the E.P.E.A. mean business in their claim for higher status for their members: they have given six months' notice to terminate the N.J.B. agreement on salaries. This is to be construed less as a threat to break their long tradition of harmonious relationship than as a means of gaining greater manœuvrability in respect of the claim, which has so far been made in the broadest terms. While few will doubt that this claim has a financial angle, the root cause lies in the apparent growing subordination of technical grades to non-technical ones, due to the higher status of the latter accorded under the present organisation. The answer to this claim must lie at least as much in the field of administration as in that of conciliation and is one which presents the greatest difficulty of resolution. Not the least of the factors is the variety of standards amongst the E.P.E.A. members themselves which range from the lower grades of technicians up to professional level, with men of a calibre suitable for promotion to the highest positions. The E.P.E.A. has provided encouragement to their members to attain suitable qualifications but the response has been far from adequate to level out the wide differences. It is this range of quality of membership that presents special difficulty in reaching a satisfactory solution to the Association's claim and the Council has not been over helpful in placing responsibility for finding the answer on the shoulders of the B.E.A. How far the shock tactics of the E.P.E.A. have so far been effective is not yet possible to assess, but quite clearly the time should not be long delayed when a more constructive approach to the problem should be made, even perhaps to the extent of some major internal reorganisation of the Association to meet its own demand for higher status for its members.

CONVENTION SUCCESS

Success attended the Eastbourne Convention from the thought-provoking presidential address to its conclusion in an intensely interesting and informative Electrical Forum, and an Annual General Meeting that was lively beyond the usual formality. In technical meetings the touchstone of quality is the discussion that follows the paper: at Eastbourne the discussions were always interesting, and they never flagged for lack of willing speakers. Breadth of subject matter paved the way for this improvement in what has been the weak spot in some earlier conventions, a result which gives point to what was said in these columns last week about avoiding a rigid convention theme. Manufacturers as well as supply engineers and the many other sections of the industry represented at the

Convention found something to talk about, and in Mr Bellamy's paper there were even a few tit-bits for the accountants and administrators, though these still feel with some justice that they are left out in the cold so far as technical sessions are concerned. There can be little doubt that the formal discussions provided plentiful subject matter for those informal chats between opposite numbers which do so much to give the Convention its special quality of cross-fertilisation of ideas. Additionally this year the opportunity was taken of using the Convention as a sounding board for the wider dissemination of the industry's ideas. There was a marked increase in representation of the daily Press at the Convention, while a large party of specialist women journalists attended for "lady's day" on Wednesday. The long term effect of such attention should be of considerable value to the industry. Nor can the conveniently situated and for once reasonably spacious exhibition be excluded from a list of reasons for success: indeed, in its reception by the general public as well as the delegates, it achieved this distinction in its own right. Eastbourne has set a new level for overall balance at a Convention: it provides an admirable foundation on which to build.

INDUSTRY'S POWER POTENTIAL

The controversy which has long existed on the use of industrial pass-out and back-pressure turbo-generators to produce electricity as a by-product of process and space-heating steam, will receive added stimulus from the survey of steam and power usage, now embodied in the current issue of the Ministry of Fuel and Power Statistical Digest. This is the first time that such information has been made available and although it is scarcely comprehensive as regards industry as a whole, it yet provides a key—a hitherto missing factor—on which full consideration may be based. Of more than passing interest, however, is the existing situation disclosed by the analysis. Industry is now producing over 7,300 million units per annum from privately owned plant, as well as some 2,200 million kWh of mechanical energy, giving a total of some 9,500 million units. This is derived from plant with an installed m.c.r. of 3,247 MW. In 1952-3, the total area board sales to industry were 25,879 million units. Thus industry is producing about 29% of its own requirements of electricity and power. On the basis of present steam requirements for process work and heat taking into account boiler utilisation, it can be shown theoretically that industry is capable of producing a further 7,000 million units/annum. But this would require the installation of some 1,500 MW of back pressure plant. Such a comprehensive exploitation is, of course, completely inadmissible on cost considerations alone, but a certain proportion may well be economic. As was pointed out by a Ministry of Fuel and Power spokesman, the field for development although small, might prove quite useful. Out of some 3,858 firms who filled in the questionnaire only 700 are regarded as possessing any power potential. The broad conclusion emerging is that the big industrial concerns are well aware of the advantages of combining electricity generation and heat requirements; and that many of the strictures made recently by interested parties are largely unjustified.

MODIFIED PLANT VICTORY

So Lord Citrine has effectively won his fight for the right to install 2,000 MW of plant in a year. For some time 1,750 MW has been the yearly ceiling fixed by the Government's economic planners, but continual importunity has secured agreement to 1,950 MW for 1959. To judge by estimates of future demand, this total will not seem in any way too large when that date is reached. Yet the same expansion schemes which point the need for such a construction programme, and which open the way for the 200 MW sets planned as part of the 1959 installations, are another factor intensifying the problem of fuel supplies. The National Coal Board appears to have admitted that it cannot supply sufficient fuel even of the low grade form which power stations are accustomed to using, and the B.E.A. is being forced to look again at the question of oil firing as an expedient to tide over the supply industry until nuclear power develops to full reliability for power station work. How little the Authority likes the idea of oil firing is apparent from its recent publication "Power and Prosperity." Oil is half as expensive again as coal on a calorific basis, there is little experience in handling it, and the troubles inherent in the presence of vanadium and sulphur are unknown, but evidently to be feared. It is ironic in many ways that the successful advance of one nationalised industry should be slowed down at a moment of triumph by the relative, failure of another. How well it is that a third, the Atomic Energy Commission, is progressing to provide some relief in the future: but the interim decade or so may prove most frustrating. The decision to give close attention to the possibility of oil-firing in a large number of power stations is a significant break with the previous attitude adopted by the B.E.A., that the provision of sufficient and suitable fuel is a responsibility of the nationalised mining industry.

RURAL ELECTRIFICATION IN N. IRELAND

When under the 1948 Act, the Northern Ireland Electricity Board was charged with pursuing a policy of rural electrification bearing its own costs for lines and transformers, with the proviso that such schemes should be carried out on the minimum possible economic return, it soon became obvious that with rising costs, the Board would require financial assistance from the Government, if this requirement were to be fulfilled. To deal with the situation, an Amending Act was passed in 1953 restoring the Board's power to demand a guaranteed minimum return, and, if found desirable, a contribution to the initial cost. It might well be thought that this would have a deterring influence on potential consumers, but, as appears from the Annual Report, the reverse seems to be the case. In 1953 no less than £612,460 was spent on rural development as compared with £360,222 for the previous year, and other schemes amounting to £496,626 were approved during the year. As the Report states, these figures are evidence of a gratifying response from applicants, and augur well for the future. They are also indicative of the power of the active and lively electrical propaganda and publicity for which the Board is noted.

Meteor

Radio Communication as an aid to Power System Operation

PART 2 — *Details of a simple System for Area Boards*

By R. E. MARTIN*
D.F.H., A.M.I.E.E.

AN elementary system for an Area Board might comprise a single fixed station transmitter-receiver having an output of 15 or perhaps 50 W to the aerial system, together with a number of mobile stations which may be of the 15 W type in a truck or a 1-2 W type in a private car. A small number of "walkie-talkie" hand portable equipments would be useful for co-ordinating operations such as phasing-out, locating cable faults, etc. A 15 W set can be mounted in a car luggage boot while a 1-2 W set is small enough to mount under the dash of a private car.

Fixed Station

The fixed station equipment would normally be housed in an existing building or may require the provision of a small building or kiosk, which must be warm and dry. The aerial system would be mounted on a mast or tower which may be from 30 to 60 ft or so high. The correct siting is absolutely vital and this fact has often caused the premature condemnation of v.h.f. owing to tests from an inadequate site being disappointing. On the other hand it is always unwise to expect too much, but ranges of 20 miles radius or more should be obtainable under average site conditions (500-600 ft above sea level). With good conditions it is not unusual to work 50 or 60 miles. Even a radius of 20 miles will cover some 1,250 sq miles in which many thousands of consumers may be living.

By employment of two-frequency working with retransmission, two mobiles can intercommunicate via the fixed station over a very much greater distance than would be possible without the "talk through" facility.

A typical fixed station transmitter-receiver installation is shown in Fig. 4. Such a station can be switched on and off and switched from "receive" to "transmit" by conventional 24 or 50 V d.c. signalling over an earth circuit and one or other of two line wires of a rented G.P.O. circuit or private wire. The incoming speech from a mobile station is passed back over the wires to the control position, and in a like manner the transmitter will be modulated by speech currents from the control position microphone.

At the control position it is necessary to provide a small amplifier which serves to raise the incoming speech on the line to a suitable level for operating a loudspeaker. The amplifier function is reversed in the transmit condition to raise the microphone level to a suitable value for application to the control line in order to modulate the remote transmitter. The speech level is usually arranged to be about 1 mW into a 600-ohm line circuit. Fig. 5 shows the control position of an Electricity Board scheme.

A constant output level amplifier which automatically compensates for variations in the input level can be used with benefit in the microphone amplifier. Differences in the speaking level or position of different operators are then automatically compensated thereby avoiding overloading or incorrect modulation. Such an audio amplifier—one has been designed by the British Electricity Research Laboratories—can compress a variation of 40 db at the input into a variation of only 3 db at the output over the frequency range. It is possible to modify the arrangements for remote switching so that the talk-through facility can also be remote controlled. Arrangements could also be made to switch to a spare transmitter receiver if required.

Control systems of this type can be operated for 10 or

*Mr Martin is with the B.E.A. Research Laboratories. The previous article in this series appeared in our issue of 20th May.

more miles over conventional d.c. 2 wire circuits and are arranged to comply with G.P.O. requirements for the connection of apparatus to rented circuits.

At least one B.E.A. fixed transmitter output is monitored by a small pick-up probe placed near the aerial, the v.h.f. signal being rectified by a germanium crystal and applied in the form of d.c. microamperes to a landline. A meter at the control position enables any deterioration in the transmitter output power to be detected. Monitoring receivers at the control position are also widely used.

Fixed Station Aerial and Site

As it is usual to require maximum coverage in all directions from a fixed station, an omni-directional aerial system is usually employed, although directional aerials can be used if, for one reason or another, it is desired to concentrate the radiation in a certain direction. This usually results in an improvement in service rather than an improvement in range. In either case the aerial systems employed are physically small and can be made very robust mechanically.

The aerial system is connected to the equipment by a screened co-axial transmission line which is usually polythene insulated. It is, of course, possible to use one aerial simultaneously for transmitting and receiving providing that the frequencies are sufficiently spaced and the requisite filters are used. The transmission line should be as short as possible to minimise losses and it is also essential that it should be properly matched—that is, it should have the correct characteristic impedance—to avoid reflections and losses. A fixed station site is shown in Fig. 6.

The fixed station requires to be well designed for continuous operation with a minimum of attention. Ministry of Supply type approved components should preferably be used throughout. The valve types should be ones capable of allowing easy replacement under emergency conditions. This means that equipments using "services preferred type" valves may be desirable for use by public utilities. The whole equipment will normally be required to operate from a 240 V 50 c/s supply but in some cases a standby supply needs to be provided. This can take the form of a small motor alternator driven from a 24 V secondary battery which is normally trickle charged from the a.c. supply. The failure of the local 240-V supply starts the machine automatically by means of a relay, so that the v.h.f. equipment remains operative.

Equipment Design

The majority of commercial equipments comprise a sensitive superhetrodyne receiver which is often of the double-superhet type. The incoming signals are usually passed through at least one stage of radio-frequency amplification before being mixed with the local oscillator output. This is obtained by multiplying up the frequency of a quartz crystal. The resulting intermediate frequency is amplified and mixed once more with a lower frequency obtained from the same crystal oscillator. The second intermediate frequency thus obtained is then amplified and passed to the demodulator, the design of which depends on whether the system is arranged for amplitude or frequency modulation.

As we are chiefly concerned, for the reasons stated earlier, with amplitude modulation in this article, it will be assumed that it is an a.m. system with which we are dealing. The a.m. demodulator then follows the usual principle used in normal domestic receivers except that interference limiters are often added at this point in the circuit. These usually operate to restrict the peak levels of impulsive interference by means of a biased diode clipper whilst leaving the steady signal practically unaffected. The receiver will also be provided with an efficient automatic volume control circuit. This a.v.c. system will hold the audio output sensibly constant over a wide range of input signal variation such as may be experienced when the remote transmitter is moving amongst trees or houses.

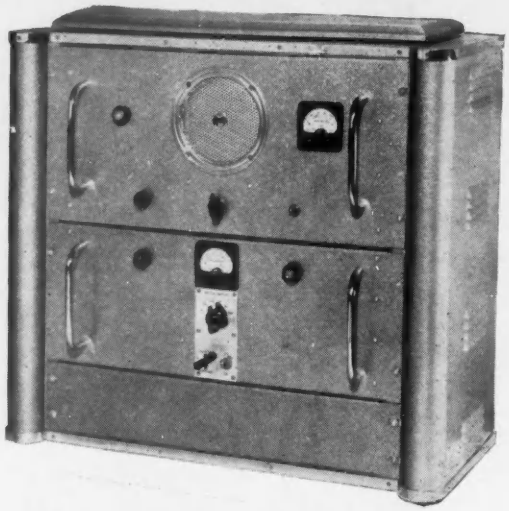


Fig. 4. Fixed Station transmitter-receiver (Pye Ltd.)

Transmitter

One or more stages of audio frequency amplification follow and at this point the low-pass filter is introduced if required to eliminate beat whistles between two or more transmitters. The reason for this latter requirement will be described later. The audio output stage is used to drive a loudspeaker or telephone handset earpiece. A typical receiver will give 50 mW audio output with an input of 1 microvolt across 75 ohms at the aerial terminal.

The transmitter, still considering the amplitude modulation case, will comprise a crystal oscillator to control the frequency, and a number of stages of frequency multiplication followed by a power output stage. For those unfamiliar with valve circuits the multipliers often consist of simple tuned amplifying stages in which the output circuit is tuned to a multiple of the input circuit frequency. The transmitter will also contain an audio amplifier to raise the level from the microphone or remote control line circuit and a modulator. There will, in addition, be a power supply unit for the transmitter and receiver which will probably be of a conventional type for mains operation.

In the case of a mobile equipment the high-voltage supply may be derived either from a vibrator or a small motor-generator. The transmitter will either incorporate a meter for tuning each stage or will be provided with test points for the connection of an external meter. The tuning adjustments once set should only require occasional checking unless a valve has been changed.

Mobile Stations

In mobile a.m. transmitters, arrangements are often made to allow the modulator to be used as a public address amplifier in conjunction with a hailer type loudspeaker. This is often useful where instructions need to be passed to a construction crew working near the vehicle.

The mobile stations will be generally similar from the electrical point of view, but their v.h.f. power output will be restricted by limitations imposed by the supply available.

The larger type of mobile station might be expected to consume about 14 amps in the "transmit" condition and 4·5 amps in the "receive" condition from a 12 V supply. The smaller mobile stations, would consume about 4 amps on "transmit" and 3 amps on "receive."

It must be remembered that the total "transmit" time is very small compared with the time the receiver alone is on. Arrangements sometimes have to be made to increase the vehicle dynamo charging rate or alternatively to provide a separate battery. With smaller equipments this is rarely necessary.

The vehicle ignition system, dynamo, windscreen-wiper etc. will need to be properly suppressed to avoid interference with the mobile receiver. Adequate attention should, in addition, be given to seeing that all rubbing parts, i.e. bonnets, boot covers, etc., are properly bonded with flexible copper braid. The standard resistors supplied for television interference suppression will usually be found adequate for use on the ignition system. A typical mobile station of the larger type is shown in Fig. 7 while our heading block shows the small control unit.

As the supply is generally 12 V d.c. in a truck or private car it is not practicable to provide for a greater v.h.f. output than about 15 W. In practice almost equal results are obtained with much lower powers, the fixed station receiver being usually superior to the mobile receiver in performance and the fixed station transmitter often having a higher power output.

It must be remembered that the workability depends on the overall loss between the transmitter and receiver. In practice the receiver sensitivity is limited by several factors amongst which is the noise introduced by the receiver itself, the type of modulation and the desired signal/noise ratio. The theoretical minimum noise is that due to the thermal agitation of the electrons in the input circuits of the receiver and its "root-mean-square power" in decibels below 1 W is 204 — [10 $\log_{10}$ (Bandwidth c/s)], where the bandwidth is twice the audio bandwidth. In practice the noise level is likely to be 5—15 dbs above the minimum so that the set noise in a 3,000 c/s audio band may be 151 to 161 dbs below 1 W.

Measured data indicate that the carrier power needs to be 12-20 dbs higher than the noise power to provide an average signal/noise ratio sufficient for moderate intelligibility. It therefore follows that a single channel voice circuit will require, in the absence of interference, an input power of roughly 140 dbs below 1 W. This is roughly equivalent to 1 microvolt across a 70 ohm input circuit —a sensitivity which can be achieved by commercially available equipment.

Multi-Carrier System

While a single fixed station scheme may be adequate for, say, a 25 mile radius coverage in the case of a large town or city, it may be inadequate to give proper coverage over a bigger area. In such a case, it is advantageous to use the multi-station scheme where all of two or more fixed stations are operated simultaneously. Such systems are now in wide use and have become known as the "Multi-carrier" system. [4, 5, 6.]

The arrangement employs two or more carefully sited fixed stations designed to give coverage to the required area. The scheme can be considered as being analogous to the shadowless lighting of a room by a number of small lamps rather than by the use of a central lamp fitting. Flutter effects due to field strength variations at a moving vehicle receiver are minimised, and, as the coverage area is effectively "floodlit," dead spots are reduced or eliminated. The fixed stations are quite standard except that their respective transmitters are tuned to frequencies 8 or 10 kc apart. As both transmitters radiate the same intelligence simultaneously, it is possible that a suitably placed mobile station may be receiving a signal from both fixed stations at one time. The bandwidth of the mobile station receiver must, therefore, be made wide enough to accept a transmission from either of the fixed stations without any adjustment being required.

Such receivers usually have a bandwidth of the order of ± 28 kc at 6 db down as opposed to ± 18 kc at 6 db down for "narrow band" receivers. If two signals are being received at once, an audio frequency hetrodyne whistle is produced in the mobile receiver due to beating between the two carrier frequencies. The frequency difference is therefore purposely chosen to cause

Fig. 5. Fixed Station control position (by courtesy of the Midlands Electricity Board)

this beat to lie at the upper end of the speech spectrum and by means of a simple low pass filter in the mobile receiver the whistle is removed while the speech is left unaffected.

To avoid distortion at the mobile receiver the two fixed transmitters must be modulated in phase. This requires any difference in route lengths of the control lines greater than about 1 mile for a typical loaded cable, or 6 miles for an unloaded circuit, to be compensated by the introduction of a phase delay network. In practice the linking of the control point to the main stations is often carried out with low power fixed-to-fixed radio links, thereby avoiding difficulties such as phase equalisation and reliance on long metallic circuits. Such control links usually use frequencies at the high frequency end of the "high band" with directional yagi aerials and horizontal polarisation. A "trigger unit" is provided which changes the main station equipment over from "receive" to "transmit" when the main transmitter control radio link receiver detects that the remote link transmitter is radiating. The muting circuit of the link receiver is often used for this purpose. Radio links will be discussed in greater detail in a further article.

Fig. 6. A fixed station site (by courtesy of the M.E.B.)

Such schemes are in wide use by the police and other public services and it is likely that their universal adoption by the electricity supply industry would result in a mobile communication scheme giving adequate coverage which would in turn be beneficial to the consumer and industry alike.

Siting of Stations

The siting of fixed stations must be carefully decided bearing in mind the coverage area required, the suitability and availability of sites, the control landlines or radio links, power supplies and accessibility. It is invariably best to choose the highest possible site in order to avoid the high cost of tall masts, and it will also be worthwhile to ensure that the site is as remote as possible from sources of interference such as passing vehicles having unsuppressed ignition systems.

However, the electricity industry is well placed with plenty of tall buildings, chimneys and towers. Although such structures are more often than not situated in deep valleys it has been found possible to operate a fixed station with its aerial system attached to a 132 kV transmission line tower and only a few feet from live conductors, as the high-voltage conductors normally cause very little interference at very high frequencies.

Coverage Area Estimation

It is possible to estimate roughly the losses[8] likely to be encountered on any route and to assess from the maximum tolerable loss figure whether the path will be workable. The papers of K. Bullington[7, 9] are particularly helpful in this respect. The losses can be attributed to free space losses, curved earth and shadow losses, etc., and the values applicable in a given case can be obtained by the use of nomograms. Such computations cannot be made except for a number of fixed points and are, perhaps, more readily applicable to the planning of fixed-to-fixed v.h.f. radio links. In this case it may be necessary to carry out a special survey over a period to determine the extent of any fading which may occur[10, 11]

Another method of determining the likely service area of a fixed station is to use light rays on a relief model of the area being investigated. A plaster model having suitable scales (a horizontal scale of 2 in.=1 mile and a vertical scale of 1 in.=400 ft is convenient) is photographed from above, the fixed station transmitter aerial being represented at the correct scale height by the filament of an exceedingly small lamp[12]. The lamp casts light rays on the hillsides and forms deep shadows in the areas beyond.

A typical photograph showing part of Kent and Essex is reproduced in Fig. 8, the transmitter being located at Wrotham, Kent, with a 100 ft mast. It must be remembered that the radio waves are, unlike the light rays, refracted over the top of hills so that only the deepest shadows in the picture will be unworkable. On the other hand, buildings and trees are not represented on the model and there is always considerable absorption and scattering due to this cause. Furthermore, the curvature of the earth is not taken into account in the models used. Nevertheless, the technique is useful for estimating the approximate coverage area of a given transmitter.

Fig. 7. A mobile transmitter-receiver fitted in the boot of an Austin car (British Electricity Research Laboratories)

Having discussed briefly some of the more important aspects of v.h.f. equipment the remaining comments will be devoted to the maintenance of the equipment.

Reliability and Maintenance

Many power engineers tend to view electronic equipment with some suspicion. Their fears are not altogether unfounded but their experience is usually based on the early domestic radio receiver. Electronic equipment will undoubtedly find wider and wider uses in the power industry, and it must be remembered that it is now possible to produce an equipment with excellent reliability even under adverse conditions such as are met with in mobile service. But not even the best equipment can be expected to give

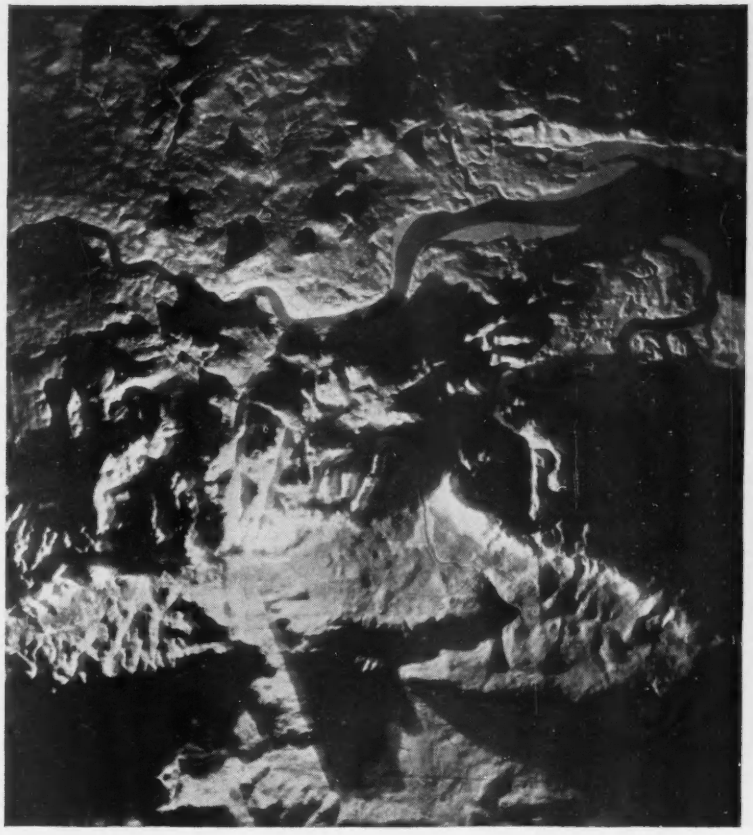


Fig. 8. Shadow picture on a relief moulded map from Wrotham, Kent (British Electricity Research Laboratories)

good service without regular routine maintenance. This is facilitated in many commercial equipments by mounting the apparatus on plugs so that sections of it can be withdrawn from service and replaced as required The minimum test equipment required for running a mobile v.h.f. service is considered to be as follows:

(a) A full set of spare units and aerials for each type of equipment used.

(b) A stock of spare consumable items such as valves (preferably CV preferred types), indicating lamps, fuses, dynamo/motor brushes and crystals.

(c) A complete set of all normally used interconnecting cables ready made up with the appropriate plugs.

(d) A signal generator covering the I.F. and R.F. frequencies in use and capable of being used to measure sensitivity and bandwidth.

(e) An R.F. output meter and dummy load for transmitter testing.

(f) A suitable multi-range test meter.

(g) A suitable valve tester for checking emission and locating short circuits.

Having now established a mobile service together with maintenance facilities, the users in the field will require a little elementary training in operating procedure, use of call signs, etc. The result will be that all mobile units are co-ordinated as a team so that speedier service can be given whether to consumers or to the transmission and distribution network itself. There is, of course, a wealth of detail which must be omitted from an article of this length but nevertheless it is hoped that a reasonable balanced picture of a v.h.f. mobile scheme has been given.

In the next part we turn to the applications of fixed-to-fixed radio equipment in the power industry, i.e. the provision of telephone circuits by radio rather than by land-line or power line carrier.

REFERENCES

1. F. W. Northrup: "Review of the Applications of V.H.F. Radio Communications," G.E.C. Journal, vol. XVI, No. 4, October 1949.

2. R. E. Martin: "Radio Communications for Power Systems," Paper 319, C.I.G.R.E. Paris, 1950.

3. H. A. Chapman: "The Single and Two Frequency Systems of V.H.F. Radio Communication," B.I.S.R.A. Restricted Report PE/B/20/50, April 1950.

4. J. R. Brinkley: "A Method of Increasing the Range of V.H.F. Communication systems by Multi-Carrier Amplitude Modulation," J.I.E.E. 93, III, 23, 1946.

5. J. R. Brinkley: "A Multi-Carrier V.H.F. Police Radio Scheme." Proc. Brit. I.R.E., May/June 1948.

6. J. R. Brinkley: "Multi-Station V.H.F. Schemes," Electronic Engineering, August 1950.

7. K. Bullington: "Radio Transmission beyond the Horizon in the 40 to 4,000 Mc/s Band," Proc. I.R.E. 41, 132, 1953.

8. K. A. Norton: "Transmission Loss in Radio Propagation," Proc. I.R.E. 41, 146, 1953.

9. K. Bullington: "Radio Propagation at Frequencies above 30 Mc/s," Proc. I.R.E. 35, 1122, 1947.

10. C. B. Wooster and F. R. Tow: "Radio Propagation Survey," A. T. and E. Journal, Vol. 9, No. 2, April 1953.

11. S. H. Wilkinson: "Radio Survey Technique," A. T. and E. Journal, Vol. 9, No. 4, October 1953.

A.M.E.E. MEET AT EASTBOURNE

A MEETING, well attended by members representing managerial staffs in the supply industry from all parts of the country, of the Association of Managerial Electrical Executive was held on 15th June at Eastbourne to coincide with the B.E.P.C., a photograph of this event being reproduced on page 949. In the chair, the President, Mr A. Kelso submitted the Annual Report for the year 1953-54. In referring to salary scale negotiations. he explained that although the general level of salaries for managerial grades had been agreed on the National Joint Committee, some positions were still under negotiation.

Proposals for Sub-Area Managers and Chief Generation Engineers, submitted by the Boards, Mr Kelso continued, had not been regarded by the staff side as adequate, and joint discussions were being continued. He pointed out that settlements had been on a general level, but subject to the understanding that every member had the right to appeal through the Association to the National Committee. In reply to a question, he stated that the Staff Associations had protested vigorously to the Authority on their failure to consult with them prior to filling senior posts in the new division created by the amalgamation of the North Western and Merseyside and North Wales Divisions. Mr E. J. Turner, Vice-President, moved a vote of thanks to the retiring President, Mr Richardson seconding.

Steam and Power Usage

Ministry of Fuel and Power Survey Issued

IN the latter half of 1953, a survey was initiated by the Ministry of Fuel and Power to assess the scope for the production of power by means of back pressure engines or turbines in industrial establishments. For that reason forms were sent out to those organisations believed to be using more than 2,000 tons of fuel a year (coal, coke and oil). To place the fuels on an approximately equivalent footing, oil was taken as twice its weight of coal. There are about 4,600 such undertakings, with a total fuel consumption of some 63 million tons/year. As the return was a purely voluntary one, not all of the forms were completed; moreover some firms did not possess the complete data required.

However, the information received has now been analysed and is issued as the "Survey of Steam and Power Usage" and is embodied in a new section of the Ministry's Statistical Digest for 1953, published on June 22nd.

Scope of the Survey

The survey covers the sectors referred to in the Ministry's coal distribution statistics as the "industrial" and "non-industrial," the latter comprising hospitals, public buildings, commercial establishments, etc. Coal mining, public utilities and coke ovens are excluded.

As far as engines and turbines are concerned, the survey includes all prime movers, whether they are driving electrical plant or not and also stand-by plant, not used during the year of return (usually a year lying between December 1952 and May 1953). Electric motors and boiler auxiliaries are excluded. The prime movers are divided into back-pressure, pass-out and condensing turbines, diesel engines and "other" the last comprising water turbines, gas and petrol engines.

The questionnaire did not ask for boiler ratings, but for their normal rate of steam production. For the purposes of size classification the winter rate was taken except in those rare cases when the summer rate was higher. It should, however, be remembered that this rating is substantially lower than that of the m.c.r. particularly in those cases where the demand for steam was very variable.

Although figures giving the numbers of boilers in various categories are included, these are not representative of the country as a whole as only 12% of all establishments consuming more than 100 tons of fuel a year are dealt with, but this 12% are responsible for 73% of the total fuel consumption in industry.

Steam Usage

As might be expected the chemical industry is well in the forefront of steam usage, followed by the iron and steel industry and then by paper printing and stationery. In fact these three industries account for no less than 3,231 million lbs. of live steam per winter working week for engines and turbines, out of a total of 4,969·5 million lbs, and for 4,815 million lbs/week out of a total of 9,369 million for process work.

Electricity production in the firms which completed the questionnaire amounted to 7,287 million units over the year, and directly produced mechanical energy of 2,916 million b.h.p.-hrs, giving a total of 9,474 million units. Of this turbines and steam engines contributed 8,968 million units; diesels 128 million units and other types of engine (water turbines, petrol and gas) some 378 million units.

A rather astonishing feature is the number of back pressure sets installed in hospitals. These amounted to 158 out of a total of 835. The only comparable figure is that for non-metalliferous mining manufacturers where 192 of these units are in use. Yet the hospital sets had a total output of only 30,000 h.p. as compared with 402,000 h.p. for the chemical industry which possesses only 96 back-pressure units.

A final table, No. 26, gives details of the electricity purchased, maximum demand, average load factor and total energy for each of the industrial categories. The largest consumer of electricity and power—both purchased and produced by themselves—is the iron and steel industry which required 6,246 million units and had an average load factor of 41%. As might be expected, the chemical industry with a requirement of 5,523 million units had the best load factor, some 67%. Taking all industries together the overall average load factor works out at 44%.

Power Potential

No conclusions are drawn officially in the statistical digest as to the potentialities available for the generation of electricity by the utilisation in pass-off or back-pressure turbines of steam required for process heat. This is mainly because of the difficulty of assessing on economic grounds the wisdom of installing the necessary plant. A rough calculation can, however, be made by using the statistics of live steam usage for process work and heating, and then by estimating the value of the absolute pressure ratio. This is the ratio of the maximum permissible boiler pressure to the principal using pressure. Broadly speaking, the output obtainable from a flow of 1,000 lb/hr of steam is of the order of 10 kW for an a.p.r. of 1·5 to 3; 20 kW for an a.p.r. of 3 to 6 and 30 kW for over six.

Using an a.p.r. of 5 for industry in general it would appear that some 1,500 MW could be added, to give a yearly output of 7,000 million units. Such an estimate is, of course, based purely on the availability of steam—the cost of the plant is not even considered.

No decision has yet been made as to what action, if any, will be taken by the Ministry when the results of the full analysis are known. It must be admitted that the power potential available from industry is comparatively small, although there may be a useful field for development. Further, the questionnaire information received from firms is confidential. A suggestion has been made that where from examination of the figures submitted from an individual firm indicates that at first sight it would appear economic to install additional generating plant, an approach may be made to the firm concerned to ask if the National Industrial Fuel Efficiency Service could investigate, but as a spokesman from the Ministry pointed out, from a batch of some forty reports where the installation of generating plant appeared reasonable, no less than ten indicated that the requisite equipment was on order and would be installed shortly. It was also estimated that only about 700 firms had a useful available potential. It was also stated by the Ministry that the amount of plant installed over the past six years was considerably greater than had been anticipated.

around the trade

by Peregrin

THE decision of the Government to accept the report of the Monopolies Commission will cause more than a flutter in electrical trade circles, and it is sad to realise that the long-standing partnership of cable makers, wholesalers and contractors is likely to end. It was a happy arrangement, and none of those concerned had cause to complain, for the quality of the cable was good, the price reasonable, and the service excellent. Wholesalers particularly will mourn the passing of the exclusive buyer's agreement. It was a coveted prize, not only for the actual profit but because an exclusive buyer of cable was of course a buyer of everything electrical and a contractor naturally tended to obtain his normal supplies from where he bought his cable. Contractors also were fond of the C.M.A., and will miss their rebates and bonuses, even though they really only amounted to a price reduction: for the wise contractor costed his work on the trade price of cable, regarding his rebates as a welcome annual roundabout to compensate for some of the year's disappointing and unforeseen swings.

Presumably competition among cable makers will now become fiercer than ever, for they have never been complacent about it. That institution of the electrical trade, the cable traveller, took good care of that. It is comforting to know that he will still be with us, for he is a good friend, a sound electrical man, and remarkably well-informed technically, considering that he rarely sees the stuff he has to sell.

Electronics

In his paper read at the E.C.A. Conference Mr Halliwell warned his fellow contractors not to specialise themselves too much, but to be constantly on the alert to seize every opportunity. He deplored that electrical retailers, or most of them, had let radio pass them by thirty years ago, and he hoped that the new science of electronics would not be received with the same indifference and apathy. It is a timely warning which I have already expressed in these columns, but the instances are not parallel, for whereas radio is still largely a means of entertainment, electronics will invade and influence almost every aspect of our lives, industrial and domestic. There is hardly any limit. Only recently the G.E.C. demonstrated that a transistor can emit heat or extract heat, according to the direction of current passing through it. Imagine the possibilities. Some day we shall have the electronic refrigerator which will make use of the extracted heat, thus providing heating and cooling with the same energy, at undreamed of efficiency, and that is only one small achievement of electronics.

There is much popular speculation and learned talk on the so-called atomic age, but the electronic age is just as spectacular, and it is not a future dream. It is here now, right among us, whether we like it or not. It is to be hoped that electrical manufacturers, wholesalers, contractors and retailers are rising to the occasion, and claiming this important electrical development as their own. Otherwise we shall see it grow into a separate industry, and its devotees a race apart calling themselves electronic engineers, with their own I.Electron.E.

Trading-in

How much part-exchange dealing does the electrical trade handle? Before the war, apart from radio, there was not much to it, and retailers did not encourage it. Now the situation seems to have changed, judging by the mass of second-hand appliances displayed for sale, and dealers generally appear to be accepting it sensibly, or perhaps resignedly. After all, a customer aspiring to a new refrigerator cannot be expected to put the old one in the dustbin. It must be disposed of somehow, and it is the dealer's job to soften the blow with the best possible allowance.

In the United States "trading-in" is big business and an essential part of the structure of electrical merchandising as they call it. As with everything else they prepare impressive statistics on the subject, and these purport to prove that two refrigerators are traded-in for every four sold, the same proportion of washing machines, but only one cleaner for every four sold. Over there, as with us, wholesalers consider trading-in strictly a dealer problem, while manufacturers confine their interest in it to preparing, and attempting to enforce, a list of standard second-hand prices for the guidance of the retailer. Investigation shows that only about 30% of traded-in refrigerators are re-sold as received from the customer, 30% are reconditioned before they can be resold while the remainder are ruthlessly "junked" or kept hopefully in stock. The figures for washing machines are very much the same, but nearly 60% of second-hand cleaners are scrapped or written off.

In this American survey the retailer is constantly reminded of one thing he is not likely to forget—that however much he describes these transactions as trading-in, part exchange, second-hand or other fancy title, the dismal fact remains that he has *bought* the stuff, and bought it with money that could be used in buying new appliances.

The inescapable inference is that the two latter partners should remain aloof no longer but join with the luckless retailer in sharing the problem. The question is—How?, and the answer does not emerge from the flood of verbiage on the subject. Incidentally, one retailer friend of mine seems to have found a solution, at least to his own satisfaction. He shamelessly attracts a customer into his shop by a tempting display of second-hand offers, and then charms him (sometimes her) into buying a new appliance instead. I have seen him do it. He claims that the new sales enable him to sell the old stuff for next to nothing or scrap it.

In my notes for 29 April I ventured an assertion that cooker sales are becoming a rarity with the private retailer. I have since been corrected by several retailer friends, some politely and others more emphatic. I am glad to find that the selling of cookers is by no means a declining custom among dealers, in fact many of them are doing very well at it. Even the comparatively low discount is not such a handicap as it may appear, for the electric cooker is a high priced article with no profitless purchase tax, and it very often produces a substantial installation job. Electrical retailers should not neglect the cooker. They have plenty of scope, and their biggest competitor is not the nationalised supply industry but the mighty Gas organisation.

Eastbourne Record

SIXTH BRITISH ELECTRICAL POWER CONVENTION SCORES A SUCCESS WITH ACCENT ON DEVELOPMENTS AND EXPORT

THE sixth British Electrical Power Convention was a success. That was the general view of delegates when they dispersed at the end of Friday's final session. Though the weather was not so good as on some previous occasions, the sustained high level of discussion which followed the thought-provoking papers received by the Convention, was an overall improvement on anything that had gone before. The more spacious electrical exhibition which was possible this year helped to keep the standard of the Convention high, and attracted a steady stream of visitors which included not only delegates, but also the general public. It seemed generally agreed amongst standholders showing domestic equipment, that the plan of opening the exhibition in the evening on some days, and admitting anyone, had been well worth while.

E. A. W. Luncheon

Some of the details of this eventful week were related in our last week's issue. Here the story is best taken up on Tuesday, when the annual Convention luncheon of the Electrical Association for Women was held under the chairmanship of the Dowager Lady Swaythling. This occasion provided the President of the Convention, Mr J. R. Beard, with an opportunity for a double appeal to the members of the Association. He called on them to press in all possible ways for the use of standard plugs and sockets. Some time ago it appeared that a satisfactory compromise had been reached on the specification of standards for these accessories, but they needed to be more widely used. The second request related to standardisation of voltage. The President called on E.A.W. members to set up a public clamour for faster progress in completing standardisation throughout the country. He thought that this would help the area boards to get the job done.

Mr Beard was proposing the toast of the E.A.W., and the reply was made by the national chairman, Miss N. Balls. After remarking that it was difficult to realise that the Association had not yet passed its 30th birthday, she went on to note that Mr Beard in his Presidential Address to the Convention had spoken of the undeveloped countries of the world, and of their need for electricity. She reminded her audience that there were undeveloped minds needing conversion to electrical ideas, even amongst the wives of men who worked in the electrical industry.

Other speakers included the Mayor of Eastbourne and, in her inimitable style, Lady Swaythling. It was deeply regretted by all that indisposition prevented the attendance of Dame Caroline Haslett at the luncheon or, indeed, at the Convention.

World Trade

After the luncheon, the Convention assembled for its second session, at which Mr H. G. Nelson presented his father's paper "Electrical Engineering in World Trade." The paper itself was summarised last week, and attention here may be largely limited to the lengthy discussion to which it gave rise. Sir George did add a word or two by telegram, however. Explaining that he was touring the Caribbean and Latin America, he said that all the countries he had visited were delighted to hear that Britain had recovered from the scars of the war and the cold war. There were opportunities in the heavy industrial field, although European competition was very active. In the domestic field and in the lighter industrial equipment, local manufacture, often linked with complete protection, was being developed, but British quality was admired.

The discussion was opened by Mr D. Maxwell Buist, Export Director of B.E.A.M.A., who thought that Sir George's reminder that there was a limit to possible hydro development was timely, though he did not think it would come so quickly as the paper suggested. Canada already realised limitations in this respect. It was often stated overseas that Britain was not hydro minded. It was not realised that she had built more hydro-electric stations than anyone else. There were many mis-statements about experience in other techniques as well.

Turning to the subject of comprehensive bids for large power projects, Mr Buist said that there was no doubt that they had their attractions, nor that they were a well-established practice of our overseas competitors. Though British consulting engineers had contributed much to British exports by their highly-developed ethical code, they should now devise some way of meeting the new desire for producing comprehensive bids.

Sir Harry Railing (G.E.C.) dwelt on the interdependance of home and export trade. Bold spending was necessary for successful exporting. He was followed by Mr E. C. Holroyde (Crompton Parkinson) who felt that more time and money would have to be given to research if we were to take the lead in electrical exports. He considered the ability to make comprehensive bids most important; it was the only way of getting orders sometimes. Some way of securing the co-operation of consulting engineers without impairing their world-wide reputation should be evolved.

He felt that manufacturers had cause to be grateful to the B.E.A. for the help given in the development of new products. The supply system in this country provided both a proving ground and a shop window.

Mr W. A. Coates (Metropolitan-Vickers) noted that the British electricity industry had climbed up in the export market since the war largely due to newly-developed markets for radio and domestic equipment. Such markets were very valuable, but they were also risky, because of the risk of competition from local manufacturers. What should not be forgotten was the position of this country before the war as the principal exporter of capital goods. It should be possible to rely on this. It was interesting to note that in steam turbine ratings, Britain led the world, with B.E.A. orders for 200 MW against a very occasional enquiry for 60 MW from overseas, while in the water turbine field the situation was reversed. In conclusion, he noted that comprehensive contracts were nothing new; they used to be dealt with by a consortium of companies. He felt that there might be some advantages in smaller firms combining to offer their goods and services in this way.

Opposition to All-in Bids

Sir John Hacking (Merz and McLellan) came next, and gave a review of the planning methods of the B.E.A. and the C.E.B. before it. He said it was the long term estimates

of the C.E.B. after the war that gave the basis for expansion plans by heavy equipment manufacturers, and this had turned out to be of advantage to the export market.

Turning to the technical details of the paper, he said he doubted if gas turbines would be developed to burn such poor coal as was handled in power stations. However, developments in gas turbine technique might quite destroy the case for widespread electrification of the railways. On comprehensive bids, his view was that the advantages claimed were quite specious. He felt it was a method of trading that was likely to die out.

Sir Vincent de Ferranti similarly had little to say in favour of comprehensive bids, suggesting that they were a very old idea, and that we had developed beyond them. A speaker from Australia, Mr V. Brain, discussed the importance of British equipment in that market, while Mr H. Nimmo returned to the remarks that had been made about hydro-electricity, saying he thought as development proceeded, reserves of water power would be found greater than was at present thought.

For the Ladies

Wednesday's session of the Convention was staged in a manner calculated to attract the ladies. The papers by Dame Caroline Haslett and Mr W. Jones which were presented were summarised last week, but neither that summary nor the necessarily brief report possible here does justice to the morning's proceedings. Mr Jones gave a smoothly presented review of modern ideas in lighting, with particular reference to homes and shops, while Dame Caroline's paper was briefly summarised on her behalf by Miss P. Thompson, and then illustrated by a well-devised dialogue sequence in which Miss V. Norvick took part with five experienced demonstrators and Miss M. Griffith of the E.R.A. Unfortunately there was no time for discussions on these two papers, except for a short contribution by Mr S. F. Steward (S.W.E.B. and Chairman, E.D.A.). On the first paper, he was emphatic that lighting had to be sold rather than lamps. If that were successfully accomplished, the sale of fittings, lamps, wiring and units would follow. Dealing with Dame Caroline's paper, he commented especially on the advantage of "visible heat" in cooker boiling plates as a means of beating gas competition, and on the need for pressing for more socket outlets.

Thursday provided delegates with a very full day, for the two sessions at which papers were presented and discussed were followed in the evening by the annual dinner and the Convention dance. The two papers concerned were those by Mr D. Bellamy and Mr S. Barlow respectively, and these, together with the discussions to which they gave rise are summarised on a later page.

Ministerial Good Wishes

Mr Geoffrey Lloyd was to have been the principal guest at the dinner, but he was prevented from coming. His Ministry provided a most acceptable substitute in the person of Sir John Maud, the Permanent Secretary. He brought a message from the Minister of Fuel and Power wishing the industry good luck in its promotional activities at home and overseas. Sir John suggested that the industry could look forward to the future with confidence, and

1, At the beginning of the Convention. The platform for the Civic Reception. 2, Annual Meeting of Association of Managerial Electrical Executive. 3, Sir John Maud at the Convention Dinner. 4, A B.I.C.C. party, with Mr McFadzean at the centre. 5, Messrs F. L. Roberts, J. B. Scott and C. J. Scott. 6, Mrs W. Pilling, Mr P. H. Flatt and Mr R. H. Rawll. 7, In the right foreground, Mr and Mrs F. H. Mann

1, Mr and Mrs Murray Robinson, Mr and Mrs G. Arrowsmith and Mr G. F. Davies. 2, The new President being installed. 3, Mr and Mrs C. Collyns Mrs Eadie, Mr G. McLaren and Bailie R. Eadie. 4, Mr and Mrs P. McKearney. 5, Top table group before the Annual Dinner. 6, Top table at E.A.W. Luncheon. 7, Sir John Dalton receives his vice-president's badge. 8, Mr and Mrs H. W. Swann, Messrs H. Lund and S. M. Hill. 9, Mr and Mrs Harding, Messrs E. A. Bromfield, P. Thorogood and Dr S. Whitehead

could expect to do even better than it had in the past.

Mr J. R. Beard, who replied, said that increasing specialisation in the electrical industry was a disadvantage that reduced the number of contacts between different branches. The Convention provided a valuable opportunity for all these branches to meet informally. Care was taken that its activities did not cross those of the Institution of Electrical Engineers. Recalling that the Convention was mainly concerned with exports this year, Mr Beard made two suggestions for help from outside the industry. The first concerned the International Bank, which was so active in financing large overseas power projects. It quite rightly insisted on expert consideration of the schemes it was to finance, and on careful supervision as they were carried through. For this purpose it commonly appointed American advisers, and out of gratitude, the people being financed purchased American equipment. Could not Her Majesty's Government give some attention to securing the appointment of British advisers?

The second point where some help from outside would be welcomed concerned the direct financing of such work. There was a need, suggested Mr Beard, for more help and risk taking by British banks in finding money for overseas projects.

The other speakers promised for the evening were Sir John Hacking and the Mayor of Eastbourne, who dealt with the toast of the guests, but in the event, there was one extra. This was Mr A. R. Sibson, City Electrical Engineer of Bulawayo, who spoke as "that anachronism, the power engineer who is a municipal official,"—a reference to the old I.M.E.A. days which was well received. Mr Sibson brought a message of good wishes from the Association of Municipal Electricity Undertakings of South Africa.

At the dance which followed the dinner, the prizes for the Convention golf tournaments were presented. The winner of the G. P. Dennis trophy was Sir Henry Self, with Mr W. Wishart (Yorkshire Division) as runner-up. Mrs. L. H. Welch won the Lady Citrine Trophy.

A Lively Forum

So to the final day of the Convention. The Electrical Forum is now a well-established feature of this, and in spite of an extra half-hour allocated to this version of the Brains Trust procedure, questions still exceeded the time available. This year the panel was composed of Sir Vincent de Ferranti, Sir John Hacking, Sir John Dalton, Lord Citrine, Sir Charles Westlake (of the Uganda Electricity Board) and Alderman I. J. Hayward (London Electricity Consultative Council).

There is no space to cover all the questions with which the Forum were faced—without prior knowledge, it should be remembered. Perhaps the one that created most electrical interest was, what are the views of the panel on London Transport's intention to replace trolleybuses with diesel buses? Alderman Hayward led off on this question with an exposition of the London point of view, taking into account such matters as the need for turning points at the end of trolley bus routes, which were not necessary with the more mobile i.c.-engined buses, and with fire service considerations which were a factor discouraging the use of overhead wires. He thought that experience had shown that the operation of diesel-engined buses was more satisfactory from the overall aspect.

No other member of the forum saw any merit in the decision. Sir John Hacking attacked it from the point of view of atmospheric pollution in the narrow London streets where tall buildings would trap the fumes that were inseparable from a diesel engine. Lord Citrine deplored the decision, saying that he could not find any complaint about the trolleybus. He revealed that the B.E.A. had

made strong representations to London Transport on this question. He profoundly regretted the decision, which he feared might be national in its consequences.

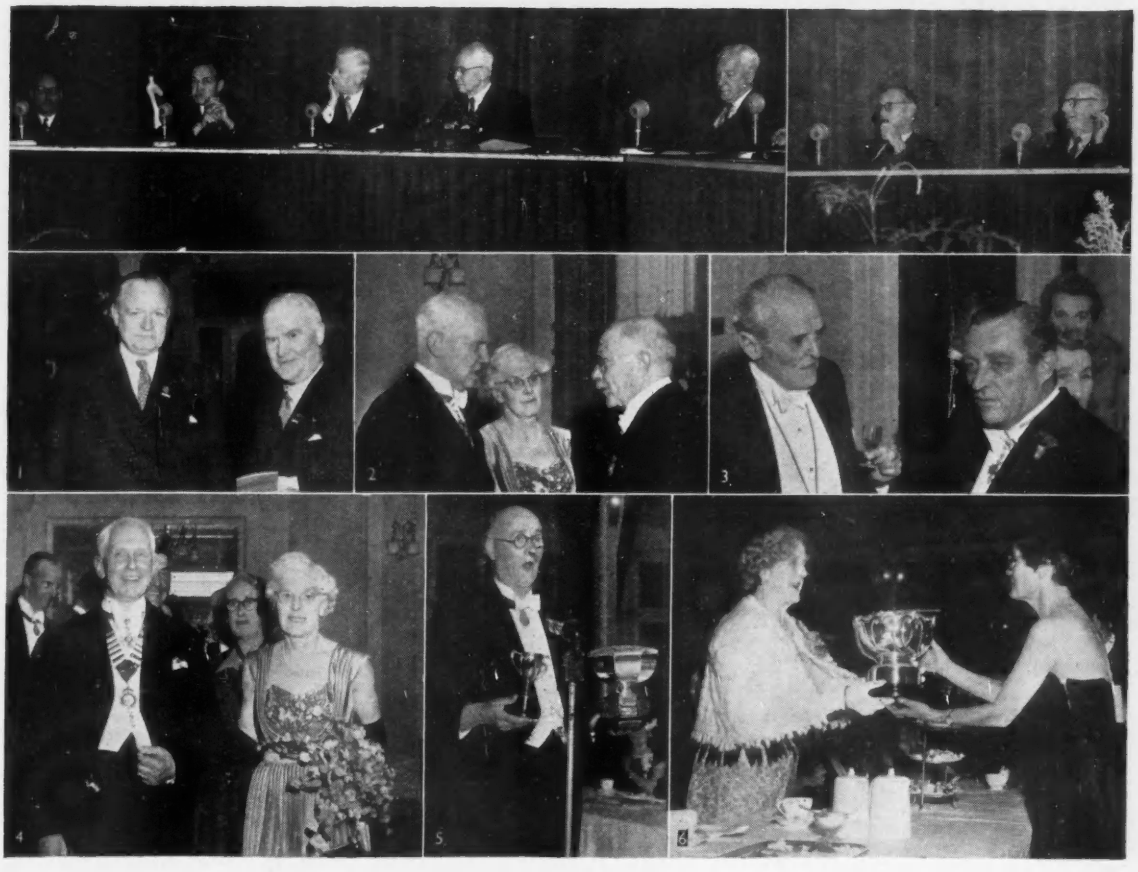
This discussion led into another question, did the electricity industry contribute to the smog disaster of 1952? Sir John Hacking doubted whether power stations as a whole contributed to smog conditions; if they did, it was only the older stations that were concerned. The newer stations had tall chimneys, designed to give a good dispersion of the flue gases. His own information was that in the still air conditions typical of fog, there was always a strong wind blowing not more than 400 ft up. The aim in design was to ensure that the flue gases reached this air stream, and were by this means spread over a wide area with negligible concentration. One of the troubles with flue gas washing to remove sulphur was that it prevented this being done, for the gases were saturated with water vapour. Investigations carried out at Little Barford power station over a long period had shown that atmospheric conditions near it were cleaner than in other rural areas, which seemed to indicate the success of the tall chimney approach.

Desirable Load Factor

One of the questions was side tracked into a more interesting discussion. The question was, simply, how can the national load factor be improved, but Sir Vincent de Ferranti wanted to know, what was the optimum value anyway. Sir John Hacking, basing his answer on present boiler maintenance practices, suggested about 60%. South Wales was at this level, and maintenance caused some difficulty there. Sir Charles Westlake said that he was hoping for 80% load factor in Uganda, and Lord Citrine pointed out that some machines on the British system were working at 87%. On the original question the main methods suggested were the working of more shifts by industry and the encouragement of greater domestic use to give better diversity.

Two other questions must be noted briefly. There was some disagreement about the efficacy of consultative councils. Sir John Dalton suggested replacing them with the direct responsibility of local authorities, but Lord Citrine doubted if this would give reasonable representation to industry, while Alderman Hayward pointed out that negotiations and discussions preceding, for example, a change in tariffs, would be impracticably prolonged. The other question concerned the usefulness of the Monopolies Commission, and this called forth some strong speaking from the forum, with no one having a good word to say. Lord Citrine, speaking of the experience of the B.E.A. *vis-à-vis* the electrical manufacturing industry said that the Authority had very few complaints to make. Unrestricted competition could not be in the best interests of anybody; a fair price margin was necessary in carrying on an industry. The Authority's attitude was that it should receive assurances as to costs through trade associations or by other special arrangements made by the manufacturers with whom it dealt. It was felt preferable to rely on the fair dealing of people with whom there were to be continuing relations.

At top, the Electrical Forum. 1, H. W. Grimmitt and T. G. Christie. 2, Mr and Mrs Beard chat with Mr W. J. Bache. 3, Messrs A. B. Wildsmith and L. C. Penwill. 4, The President and Mrs Beard. 5, Sir Henry Self and 6, Mrs Welch receiving their golf trophies



Another question which called forth some strong speaking concerned productivity teams and their journeys to the United States. Sir John Hacking suggested that teams were shown the best methods used in the U.S.A., and then came back and praised certain methods which they could have seen on a well-organised tour of similar factories and establishments in Great Britain. More attention should be given to ensuring that teams knew what was going on over here.

International technical conferences also came in for some criticism. It was felt that they were sometimes overdone, though the value of improvements in technique as a result of international co-operation was recognised. Modern industries could not be run without international co-operation. It was most important that British papers presented to such conferences should be of the highest technical standard.

The final point discussed was that of standardisation of voltage. Lord Citrine said the whole problem was an inheritance of vesting day. The industry had been spending three-quarters of a million pounds a year just for replacement of consumers apparatus in voltage standardisation, and this was being stepped up to £1½m. Standardisation was bound to be a long job. Sir Vincent de Ferranti asked that attention should be given to lessening the variation in voltage from the declared value.

On to Margate

After a short recess, the Convention proceeded to its A.G.M. The investiture of Sir Harry Railing as the new President was warmly received, as was the appointment of Sir John Dalton as the Vice-President. There was a more mixed reception to the announcement that Margate would be the venue of the next Convention, which is planned for the week commencing 6 June. One of the attractions of Margate, however, is an exhibition site providing 28,000 sq ft of floor space.

There was some question at the meeting about the availability of sufficient hotel accommodation at Margate. It was stated that anyone finding difficulty in making arrangements should contact Mr J. W. Simpson, the Secretary of the B.E.P.C., who will give what help he can.

So, with the usual votes of thanks to all concerned, the very successful Sixth British Electrical Power Convention came to an end.

Installations at Home and Overseas

by S. L. M. BARLOW, Associate I.E.E.

ALTHOUGH British electrical installation practice carried out to the I.E.E. Wiring Regulations is the safest and soundest in the world, there is always something to be learnt from others. That is the view of Mr S. L. M. Barlow, who on Thursday delivered the last paper to the Convention under the title "Comparison of Electrical Installation Practice at Home and Overseas." Mr Barlow is immediate past president of the Electrical Contractors Association and Vice-President of the International Association of Electrical Contractors.

In a general discussion of the financial components of an electrical installation, with which his paper opens, Mr Barlow suggests that the appointment of a consultant with an intimate knowledge of practical installation problems can be of enormous benefit in ensuring a well-planned job at an economic price. For a normal type of electrical installation the ratio to the total cost of construction of a building should be between 7% and 10%, though for blocks of flats permitting a skeleton type of installation, the ratio may be as low as 4%. The contractor's costs are about equally divided between labour and materials.

In comparing foreign practice with British, the two aspects needing the closest attention are pre-planning and conservation of labour. In European countries, it is found that the standard of safety commonly employed would be quite inacceptable in this country. Tools used by contractors are generally not so good as ours, but this does not apply to a German-made portable electric hand tool, designed for chasing building material by means of two-piece adjustable disc cutters which can make chases up to 1 in. wide and 1½ in. deep. This machine is, however, unsuitable for cutting concrete or very hard brick.

U.S. Wiring Practice

When British and American wiring practices are compared, fewer important differences are found. Yet far more attention is given in America to pre-planning, largely because of the high cost of labour. It is not unusual in the case of a large contract to prepare complete layout drawings of every run and fixture to be installed. This may expend more highly skilled labour than if the job had been left to the site foreman; yet there is little doubt that in this country too much is frequently left to him. Careful pre-planning may often save a vast amount of labour and materials, and reduce holdups on site.

Amongst the many details of American wiring practice which Mr Barlow mentions, there is room here to describe only a few. A recent introduction is a corrosion-resistant conduit consisting of a standard galvanised conduit to which polyethylene is added by an extrusion process. Any cracks in the covering, as well as any fittings, are wrapped with 10 mil polyethylene or vinyl-backed electrical insulating tape having a thickness of 10 mils and a pressure-sensitive adhesive.

Three aspects of working on conduit demonstrate the length to which the Americans will go in order to conserve labour. Much of the conduit used is knurled internally to ease the drawing-in of cables; alternatively, a special interior lacquer finish is employed. Some manufacturers inchmark the outside of the conduit during manufacture to save time in measurement. Power tools cover a wide range of jobs—threading, abrasive cutting, hydraulic bending reproducing on a pattern, reaming, and punching-out holes in boxes and other devices. Fittings and accessory boxes, although far less robust than the British equivalents, are undoubtedly designed to aid rapid and efficient installation. Special boxes for individual fittings are avoided as far as possible, and boxes are often made octagonal to give eight angles of entry.

It is noticeable that the Americans install a greater density of socket-outlets than is usual in this country. The installation of 65 outlets is considered normal practice in an average six-roomed house, while for the one bedroom

1, Sir John Hacking proposing the toast of The Guests at the Convention Dinner. 2, Fashion Show at the Ladies' Tea. . 3 to 7, Speakers on Mr D. Bellamy's paper: 3, Mr D. P. Sayers. 4, Mr R. Y. Sanders. 5, Mr Bellamy reading his paper. 6, Mr A. M. F. Palmer. 7, Mr N. F. Marsh

low cost house of the prefabricated type, they normally install 18 outlets. Many six-roomed middle class homes have from 80 to 120 outlets, in order to fulfil prevailing ideas of adequate wiring.

Greater consideration is given in America than in this country to obtaining a high level of adaptability in an installation. Perhaps the greatest contribution that can be made in this respect is early and close collaboration between the architect and those responsible for the design of the electrical engineering services, so as to provide adequate pipe-races, ducts, voids behind suspended ceilings, and similar facilities. Small circuit-breakers which can be plugged into the main busbars facilitate modification and extension of installations.

In the penultimate section of the paper, Mr Barlow discusses labour problems. After reviewing rates of pay and hours of work in this country and overseas, he says it is certain that no country in the world has a more highly-skilled operative than the British, nor can he be equalled in production when he puts his back into his work. Output in the electrical contracting industry now stands at about 70% of pre-war, as against a lower figure a year ago. Gradual improvement may come through concentration on apprenticeship schemes

In conclusion, it is to be noted that the British electrical contractor has of late widened his field of activity, and is undertaking a greater volume of work abroad. He will be helped if manufacturers produce the type of equipment and fittings required, but they must remember that time is not on their side. Devaluation gave an opportunity of breaking into some markets that were previously largely North American, but German competition is increasing.

DISCUSSION

MR C. J. VENESS did not agree with the author that there was little to worry about concerning electrical accidents. He asked if any consideration was being given to the total loading of conductors in conduit and trunking. The present method of basing permissible loadings on cable sizes was unfair when many of the cables were used for control circuits.

MR P. MCKEARNEY (Ministry of Works) was in agreement with the idea of pre-planning, though he did not care for the word itself. It was necessary to know in detail the use of a building if this were to be done, and such details as the layout of furniture and of other services. He thought that the modern architect was alive to the need for specialisation, and was ready to listen to professional advice. Perhaps the most valuable lesson to be learnt from a study of wiring in the U.S.A. was the increased use of power tools. Comparing U.S. and British costs, however, he had been agreeably surprised to find that the advantage was with British methods.

MR D. D. WALKER (Evershed and Vignoles) wondered if the reason for the better safety record in this country was due to our higher standard of testing. Mr H. W. SWANN (Chilton Products) raised the query, should the I.E.E. Wiring Regulations give more space to maintenance and repairs than there was in the 11th and 12th editions. He noted the increased fire risk attaching to ageing electrical installations, and put in a plea for the extension of contracts for the maintenance of electrical equipment and even wiring installations.

DR H. H. BALLIN (Thorn Electrical) described the preference for less-warm shades of fluorescent "white" in the U.S.A., and suggested that this might be due to our lower levels of illumination. He said we had the leadership of Europe so far as the design of fluorescent lamps and fittings was concerned.

MR J. D. SHAW (E.C.A. of Scotland) welcomed the idea of earlier planning. The general contractor and the architect were the offenders: however, if a contract could be planned and carried through without modifications it would give more profit for the electrical contractor. Quality depended largely on the contractor and his site foremen. The "all-in bid" mentioned in other sessions sometimes gave rise to an increase in pre-planning. He agreed that we were behind the U.S.A. in the use of mechanical aids, but asked for earlier electricity supplies on site. Sir VINCENT DE FERRANTI spoke in favour of small circuit-breakers as against fuses. Mr T. W. HEATHER (G.E.C.) discussed at some length comparisons between conduit in this country and the U.S.A.

MR BARLOW replied at some length.

Developing the Domestic Load

by D. BELLAMY, O.B.E., D.L., Comp.I.E.E.

QUESTIONS of the domestic demand and diversity are ably dealt with by Mr D. Bellamy (chairman, Yorkshire E.B.) in the paper which opened Thursday's Convention proceedings. He takes examples of domestic development which had proved competitively economic before the war, and analyses the conditions which differ from those applying then, and which are responsible for the doubts arising today concerning the danger of a serious increase in simultaneous peak demand as a result of domestic development.

In comparing figures for 1937/38 and 1952/53 on a country-wide basis, the first important conclusion that emerges is that an increase in running costs of 200%, is brought down to an increase in average overall cost per unit of 20% as the result of greater output and an improved load factor. In the comparison, the effect of a 10·8% improvement in load factor is a saving of £50m in the cost of the energy concerned. Now, the first and most important requirement for the creation of a higher overall load factor is a wide diversity of demand; the second factor is the encouragement of additional use over extended hours. Many figures are presented by Mr Bellamy in extension of this point, and his final conclusion is that increasing domestic electrification undoubtedly satisfies their requirements.

Passing on to the question of individual consumers, he stresses the necessity for providing adequate wiring in houses. It is especially important that no action by the landlord in cutting expenditure on electrical installations should so restrict the consumer's use of electricity that it prejudices the activities of the supply authority in making their outlay economic. If any such steps are taken by the landlord, it would not be unreasonable to ask for a contribution to the costs of a supply, but such contributions are undesirable; adequate wiring with facilities for the use of alternative fuels is the only really satisfactory economic position from the standpoint of all concerned. If necessary, however, it is better to increase the price of the first block of units covering the comparatively restricted use, rather than require a capital contribution.

From considerations of the economics of domestic electricity supply, Mr Bellamy turns to consider recent developments at home. Amongst the technical features he recommends are a larger number of substations in distribution systems, with smaller transformer capacity, equipment being placed outdoors where possible. These can give a 20% saving on expenditure on copper, though at the cost of losing some flexibility in maintaining supplies in the event of failure of equipment.

Hire-Purchase

For the large mass of domestic consumers, hire-purchase is considered to be a sound method of providing domestic electrical equipment. Long-term hire-purchase is particularly important in connection with equipment for cooking and heating. To develop this valuable market fully, however, close co-operation between manufacturers and the supply authority is essential. The manufacturer has to recognise that prices must be economically competitive in order to stimulate the demand. On the other hand, the supply authority must accept the necessity for further capital outlay as a means of making remunerative the original capital outlay involved in giving a supply.

It is felt that supply authorities cannot afford to regard hire-purchase schemes for cookers and water heaters as a source of separate profit-making, though they must not be subsidised. Long term h.p. schemes introduced by the Y.E.B. at the beginning of the year doubled the sale of cookers in two months, while the sale of water-heaters went up tenfold.

Summing up this part of his paper, Mr Bellamy says that favourable circumstances exist for building up the domestic load, and it is necessary to do so. The availability of electricity supply for homes is a necessity, and its greater use is economical and profitable for both consumer and supply authority.

DISCUSSION

MR N. F. MARSH (E.M.E.B.) said that although he agreed with long-term hire-purchase (he used up to 10 years' repayment) it presented some difficulties. Simple hire was needed to get below about 1s. 9d./week for cookers, and 1s./week was needed to satisfy part of the demand. He did not understand why simple hire had suddenly become immoral as a method of financing consumers.

MR A. N. IRENS (S.W.E.B.), speaking as one mostly concerned with industrial supplies, said there had been a feeling that industrial tariffs had been used to subsidise the domestic consumer. It was necessary to tell industry that the drive for increased domestic loads was directly in the interests of the industrialists. Mr R. Y. SANDERS (B.E.A.) who followed said that the peak responsibility method of allocating costs used by Mr Bellamy could not be carried too far, and could not be used for detailed planning.

MR A. M. F. PALMER (Staff Associations' Committee) supported freedom of choice for consumers, combined with a true cost basis of charging for competing fuel services. It was necessary that sales and operational staffs should be informed of the pricing policy of the industry.

MR D. P. SAYERS (M.E.B.) tackled the problem of improving the load factor, and in this connection suggested that the form of the bulk supply tariff needed modification. The cost of the last 50 MW needed to carry the industry over the peak was three times the average cost. The tariff should give a day and night differential. The Super-Grid, when in operation, would give the Authority the opportunity of obtaining the lowest operating costs. Miss V. NORVICK (E.A.W.) supported especially what had been said about hire-purchase and hire schemes. She asked, however, for a better follow-up service after appliances had been installed in consumers' homes. Mr R. BIRT (S.E.B.) thought that the author was correct in saying pre-payment meters were promotional in effect.

MR H. BEARD said that in South Africa the load had increased so rapidly that there had been no need for sales promotion. The use of over-riding control on water heaters had improved the load factor. Mr J. A. SUMNER (E.E.B.) said that unless the electricity industry developed the heat pump, the gas industry would. With the heat pump it was possible to provide hot water and refrigeration services for a large house with a load factor of 20% and a maximum demand not exceeding 4 kW. Mr K. W. ALLEN (Jersey) called for more money to be spent on advertising, while Mr A. C. HAZEL (Hurseal Ltd.) emphasised the advantage that electricity could be made completely safe.

Northern Ireland Rural Electrification

OF particular interest in the Twenty-second Annual Report of the Electricity Board for Northern Ireland is the progress that is being made in the development of rural electrification. In May 1953 the Electricity (Supply) (Amendment) Act (Northern Ireland) was passed, restoring to the Board powers to require either a minimum revenue return or a contribution toward the capital cost of making a supply available, or both. These powers had been withdrawn under the 1948 Act, and the Board was consequently finding it increasingly difficult to fulfil its financial commitments. During the year the capital cost of works carried out on rural development amounted to £612,460 as compared with £360,222 for the previous year.

Some 8,746 new consumers were connected during the year under review, 3,771 in urban areas, and 4,975 in rural areas. At the end of the year the total number of consumers connected was 126,235, of which 76,107 were in urban areas and 50,128 in rural. Farms connected were 1,448, making a total of 7,966.

Total borrowings at the end of the year were £15,845,000, but the borrowing powers of the Board remained unaltered at £20,000,000. Total gross revenue income for the year amounted to £2,540,731 compared with £2,288,750 in 1952. The Revenue Account shows a credit balance of £728,446. After all charges had been paid, a credit balance on net revenue account of £9,560 was carried forward.

The installed plant capacity at Ballylumford remained unaltered at 124·5 MW and the Belfast Station at 174·75 MW. Total number of units generated at Ballylumford was 449 millions and the maximum load 116·9 MW. Load factor, based on units sent out, was 43·84%.

The outstanding site investigations and surveys in connection with the proposed Bann Hydro-Electric project having been completed, the Ministry of Commerce in accordance with the Electricity Supply Act prepared in May 1953 the No. 3 scheme for a hydro-electric project on the River Bann. Borings and surveys for a hydro project near Sion Mills on the Mourne River were completed during the year and it is anticipated that the Ministry of Commerce will be in a position to prepare a scheme. Approximately 240 miles of e.h.t. lines were constructed during the year, and 755 transformers erected. Alterations were also carried out in many of the substations. By the end of the year the mileage of e.h.t. lines comprising the Board's system was 209 miles of 110 kV; 1,240 miles of 33 kV; 1,309 miles of 11 kV, and 112 miles of 6·6 kV, a total of 2,870 miles. The total number of transformers in service was 4,091.

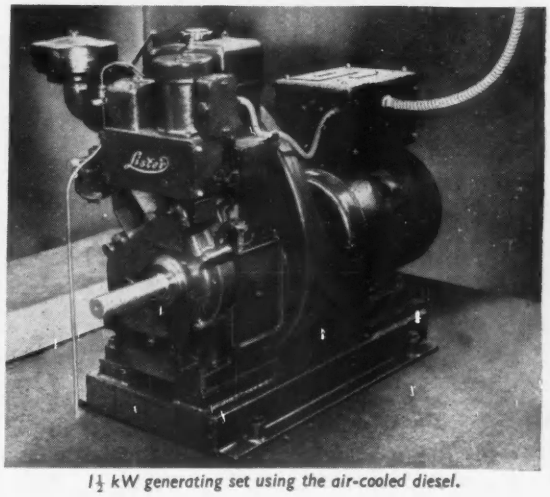
Sales of appliances improved, and increased financially from £90,079 in 1952 to £100,983. The Board's hire purchase schemes proved attractive particularly for the purchase of cookers, the sales of which rose from 1,543 in 1952 to 2,020 in 1953.

Small Power Air-Cooled Diesel Engine

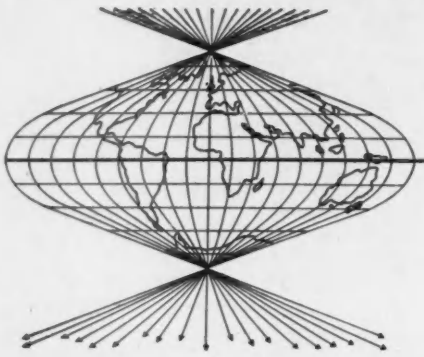
FOR engine-driven generating sets for use on isolated farm and domestic premises without an electricity supply, or as a mains failure standby, the diesel engine has many advantages over sparker ignition engines. Where operating conditions make light weight and portability essential, or where water cooling is not convenient, air-cooled diesel engines are most suitable and, for this purpose, R. A. Lister and Co., Ltd., of Dursley, Gloucestershire, are now producing on a commercial scale their new 3½ h.p. type "AD" air-cooled diesel engine. One of several features of this power unit is its complete interchangeability with Lister's "D" type petrol and vaporising oil engines.

Last week opportunity was taken to visit the Wroughton works, near Swindon, at which the engine is made. Its design, started some seven years ago, anticipated a demand for a small power diesel engine of almost universal application and capable of giving reliable service under extremes of climatic conditions. Tests have shown these engines to run satisfactorily in a temperature of 132° F (over 50° C) at full load with up to 100% relative humidity. At the other extreme, they have been started at −19° F without difficulty, using fuel and lubricating oil appropriate for this service and the oil-starting device fitted as standard to each machine.

A four-stroke unit, the engine output ranges from 3½ h.p. at 1,800 r.p.m. to 1¾ h.p. at 900 r.p.m. with intermediate points of 3 and 2 h.p. at 1,500 and 1,000 r.p.m. respectively. A half-speed shaft is also taken out. Fuel oil consumption is stated to be 0·55 lb/b.h.p./hr and lubricating oil 1·5% of this figure. Governor performance complies with relevant British Standard requirements at all speeds, the settled variation at 1,500 and 1,800 r.p.m. being ± 1·5%. It has a dry weight of 250 lb. To ensure effective cooling, the cylinder head has fins of unusual depth, whilst the aluminium die-cast fan mounted on the crankshaft maintains an adequate supply of air. Starting under cold conditions is assisted by the method of combustion, which is by direct injection into a combustion chamber in the crown of the piston. A Pintle type injector, with a single large hole, is employed. For generating purposes, the engine can be supplied complete with a 1½ kW close coupled 230 V, 50 c/s alternator of the self-excited, self-regulating type. It is available for either hand, remote or on demand starting. For marine auxiliary work, the generator may be driven from the normal shaft, the half-speed shaft being used for driving an air compressor.



1½ kW generating set using the air-cooled diesel.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

N.S. Expansion

Sales of electricity during 1953 by the Nova Scotia Light and Power Co. amounted to 331·6 million units, an increase of 11% over the previous year's figure. Sales to domestic consumers rose by 21% to a record 121·4 million units. The report shows that the average residential consumption for the year was 1,978 units, compared with 1,714 units in 1952. Mr J. C. MacKeen, the president, states that there are indications that consumer growth will continue at a high rate—a further 3,027 were connected last year. The company is considering the development of a power plant at Tufts Cove, where four generators with a total capacity of 60 MW to 100 MW could be installed to meet the increasing demand.

Promoting Development

Plans for co-operation in promotion of the use of electrical power and appliances were discussed recently at a meeting of officials of the Saskatchewan Power Corporation and some 30 representatives of the manufacturers and distributors of electrical equipment. A committee was set up to continue work on the plans. This is the first time such a meeting has been held in Saskatchewan, we understand. One of its results will be the district electrical shows, staged by the power corporation and appliance manufacturers in co-operation with local dealers.

Power from Oil Shale?

Engineering and construction plans have been completed for a scheme to produce electric power from the burning of oil shale in New Brunswick—probably Canada's first such project, it is claimed. The company concerned is the Nashwaak Corporation of Canada Inc. (which apparently is financially backed by a New York investment house). The Nashwaak concern is now negotiating with the New Brunswick Power Commission for the sale of power it will produce from the burning of the ore from its shale deposits at Hillsbrough, twenty miles south of Moncton, N.B. By-products of the process are alumina and potash. The process used to extract the alumina and potash will require the burning of crushed shale. The excess heat developed will be used for the steam generation of electric power. The potash part of the burned shale might form the basis of a fertiliser industry if that mineral is extractable on a commercial basis.

The $7½ millions power plant envisaged by the company would generate 40 MW through two 60 cycle machines. Mr C. H. Forbes, vice-chairman of the New Brunswick Power Commission, in confirming that negotiations with the Nashwaak concern were under way, intimated that the major issue under discussion was one of price. The other factor still to be straightened out was that the Commission was not yet ready to take power on a 24-hour basis. Officials of the company claim that under the scheme, electricity would be produced cheaper than hydro, because of the smaller capital investment involved.

S. AMERICA

Tram Conversion?

In Paraguay the possibility of converting the existing tram services to trolley buses in Asuncion is being studied, we learn. It seems that the introduction of trolley bus services in the central part of Asuncion is contemplated within the next two or three years, the cost of the project being estimated at around $1 million.

A Plant Problem

In New Amsterdam, British Guiana, discussions have been taking place regarding proposals to augment the existing generating plant of the town council. It has been suggested that the council should purchase three 20-year old diesel generating plants, but there is apparently strong opposition to this proposal. Meantime, it seems that a group of West Indian investors have intimated that they were interested in the conditions for a 50 year or more franchise for electricity supply in New Amsterdam. The council has rejected that suggestion, it is stated.

SWEDEN

New Power Station

To be Sweden's second largest power station, the Kilforsen plant, which is to have an installed capacity of 285 MW, was officially inaugurated by Prince Bertil a few days ago. Although ranking next in capacity to the 375 MW Harspranget plant above the Arctic Circle, it is claimed that the Kilforsen station is more massive as a building project. The station will house three Francis type turbines supplied by Karlstads, operating on a 324 ft head, and driving Asea generators. The station will feed into Sweden's 380 kV grid network. Kilforsen derives its name from one of the nine rapids in the lower part of the Fjällsjö river, a tributary of Angermanalven which is the source of a great deal of the country's electric power. Construction began in 1947. There is a 4 km long tunnel about 13 metres wide and 17 metres high, which in addition to passing water from one artificial lake into another, also takes floating timber. A travelling motor-driven platform has been installed in this tunnel in order to survey floating and prevent congestion of logs, (about five million logs are to be floated annually). From the second lake water is fed to the power station. The station hall is some 330 ft in length.

GREECE

Another Station

A 5,000 kW hydro-electric plant on the Louros River in Greece, has been officially inaugurated. The plant is situated 40 miles to the south of Jannina, and is intended to supply the whole of Epirus, in northwestern Greece. The scheme involved the construction of a dam about 45 ft high and 330 ft long. Initially the plant is intended to be operated as an isolated system, but ultimately it may be inter-connected with other stations under the second phase of the Greek electrification programme. The project was supervised by the American engineering film, Ebasco Services, Inc.

AFRICA

Cape Town's Problem

Selling just over 575 million units—an increase of 5·4%, the City of Cape Town Electricity Department made a gross profit of £254,429 from operations during 1952, the report of the city electrical engineer, Mr C. G. Downie, just received, shows. Of that sum, £225,377 goes to interest and sinking fund, and £4,659 to other allocations and the remaining £24,393 is transferred to the relief of rates, the smallest sum yet set aside by the undertaking for that purpose. Domestic service accounted for 361·5 million

units, and cooking and water for 7·2 millions. Table Bay power station generated 828·1 million units at a thermal efficiency of 23·68%, and Salt River station contributed 181·6 million units at a thermal efficiency of 17·27%. The pooling agreement under which the generating resources of the City Council and the Electricity Supply Commission of South Africa have been pooled since 1932, expires in May, 1957, and is not to be renewed. By that time the Council's plant capacity will be short of the demand, and although preliminary work in connection with the construction of a new power station has been undertaken the Council will take a bulk supply from Escom for about six years. Land near to the Council's sewage disposal works has been earmarked as a likely site on which two stations with a total installed capacity of 360 MW could be erected.

A Scheme for Freetown

There are now hopes that an early start will be made on the first stage of the £2½ millions water supply and hydro-electric scheme for Freetown, although there are still a number of matters to be settled, we understand. Primarily, it is a water supply scheme, aimed at storing water during Freetown's six-months' rainy season. The project would involve the driving of three tunnels, laying an aqueduct to Freetown, constructing a reservoir and building a dam (the size of which has still to be agreed upon) across the Guma Valley, some 18 miles from Freetown. It is estimated that the dam will give a daily flow of 18 million gallons, of which 12 millions could be utilised for generating electricity. Consulting engineers involved in the project for the Crown Agents for the Colonies are Howard Humphreys and Sons, the electrical side being handled by Preece, Cardew and Rider.

S.W. ASIA

Ceylon Development

The World Bank has now officially approved its first loan to Ceylon, equivalent in various currencies, to $19,110,000. The loan is for 25 years, and is intended to finance the second stage of the country's Laksapana hydro-electric scheme. It has recently been reported that contracts for this work have been awarded to German, French and Italian companies.

Finance for Pakistan

A loan of £6 millions sterling has been made to Pakistan by the International Bank for Reconstruction and Development for the construction with six British Banks participating, for the purpose of constructing a natural gas transmission pipeline from the Sui gas field in West Pakistan to Karachi, to which we referred on 27 May. One of the main aims of this project is the establishment of generating stations along the route of the 16″ pipeline.

AUSTRALIA

Brisbane's Better News

Judging by the present progress, it now seems certain that the first stage of the Tennyson power station of the Brisbane City Council, will be in operation at the end of this year, Alderman W. C. Coutts, chairman of the Transport and Electricity Committee has stated. Commissioning of the first 30 MW Parsons set would be the turning point in the necessity of imposing power cuts. Work being completed by the Council's Planning and Building Department now permitted stators to be stored in the maintenance bay. Previously that plant had been stored in various suburbs, he added. With the operation of the Tennyson power station, it seems likely that the Council will rehabilitate its New Farm power station, where much old equipment is installed.

Plant for Victoria

Regional power stations at Shepparton and Warrnambool have now been completed by the State Electricity Commission of Victoria. Shepparton has three 1,850 kW and six 830 kW diesel sets, while at Warrnambool there are six 830 kW machines. Giving this information, the Premier, Mr Cain, said that "packaged" plants ordered from the United States early in 1951 were now being erected at Geelong, Ballarat and Mildura. At Geelong and Mildura the last generating sets were undergoing running tests—Geelong has three 10,000 kW sets and Mildura two 5,000 kW machines. At Ballarat three 5,000 kW sets are operating and a fourth is undergoing tests.

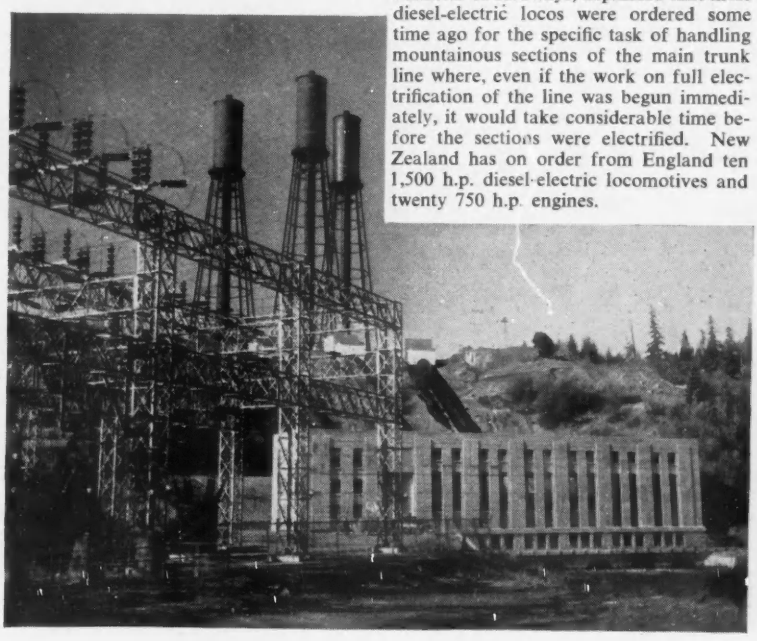
Rural Subsidy

Within the next seven years at least 70% of the farms in New South Wales will be receiving a public electricity supply. Announcing this, Mr J. B. Renshaw, Minister for Local Government, said that subsidies paid by the State Government totalled well over £3 millions to date and about 13,000 miles of new lines had been erected. In the last three months Government grants approved for rural extensions totalled over £432,000.

NEW ZEALAND

Railway Electrification Survey

The New Zealand Government has now received the report of its London consultants regarding the electrification of the North Island main trunk line, involving the Morningside deviation. The recent arrival from England of diesel-electric locomotives caused some query as to the Government's intentions on this scheme, it seems, but Mr Goosman, Minister of Railways, explained that these diesel-electric locos were ordered some time ago for the specific task of handling mountainous sections of the main trunk line where, even if the work on full electrification of the line was begun immediately, it would take considerable time before the sections were electrified. New Zealand has on order from England ten 1,500 h.p. diesel-electric locomotives and twenty 750 h.p. engines.



To meet the increasing demand for power on Vancouver Island, the John Hart development of the British Columbia Power Commission has been further extended, bringing the capacity of the station to 120 MW. Our photograph alongside, shows the station as recently completed, with its surge tanks, and in the foreground, the switchyard. The John Hart station is on the Campbell River, and, as it is now complete as originally designed, consideration is being given to further development of the river upstream at Ladore Falls, at the outlet of Lower Campbell Lake where an additional 20,000 h.p. installation is contemplated. The John Hart station was first put into operation in 1947 with two 20 MW generators, two more being added in 1949 and the final two sets along with a third pipeline late last year. The Francis type turbines operate on a 400 ft head, and are direct-connected to Westinghouse alternators. Water is fed to the station via 3,600 ft of wood stave pipeline and 2,200 ft of steel pipe. There is a possibility that additional water storage will be provided at Buttle Lake, where it is proposed to erect an impounding dam, but there has been strong local opposition to this plan which is still being considered

Personalities

IN THE INDUSTRY

Mr N. Matthews, A.M.I.E.E., has been appointed deputy station superintendent at Carlisle power station, North-West Merseyside and North Wales Division, B.E.A., as from 1 Aug. next. Since July, 1949, he has been second assistant engineer in No. 1 sub-division. Mr Matthews started his career with Carlisle Corporation Electricity Department in 1936 as an apprentice. After war service he returned to the undertaking and has successively held the posts of control room engineer, boiler house shift charge engineer, plant test engineer, and assistant boiler house superintendent.

Elliott Bros. (London) Ltd. announce the appointment of **Mr E. B. Schofield** as area sales engineer for Lancashire, Cheshire and the West Riding of Yorkshire. Mr Schofield will specialise in the electrical measuring instrument side of the company's business and will operate from their Manchester office.

Sir Walter Puckey has been elected president of the Institution of Production Engineers for the second successive year.

McKechnie Bros. Ltd. announce the appointment of **Mr G. C. Walton** to the post of sales manager at their Metal Works in Rotton Park St, Birmingham, with effect from 1 July. Mr Walton has been manager of the firm's Newcastle-on-Tyne branch for many years.

Mr D. J. Thomas, secretary of Sydney S. Bird and Sons Ltd., and **Mr G. B. Francis** have been appointed additional directors of the company.

Until recently district installations engineer with the Southern Electricity Board **Mr F. E. Richardson** has joined the staff of Wandleside Cables Works Ltd. as manager of the South, South Western and South Midlands areas. He received his technical education at Leeds Technical College, and early training with the Metropolitan Vickers Electrical Co., Ltd., and Greenwood and Batley Ltd. Prior to vesting day he was with the Mid-Southern Utility Co., Ltd.

Recently elected president of the Electrical Society of Glasgow is **Mr W. E. Macdonald,** A.M.I.E.E., who has served at the Glasgow branch of the General Electric Co., Ltd., for the past fifty years. He started in the Estimating Department of the branch and subsequently filled various posts until 1920 when he was appointed manager of the Ventilation and Small Motor Department. Mr Macdonald had a long connection with the evening classes of the Glasgow Technical College, and in 1938 wrote a thesis on f.h.p. motors.

The Minister of Fuel and Power has appointed **Captain L. R. Hibbert,** as a member of the Midlands Electricity Consultative Council. **Alderman H. T. Bush,** O.B.E., J.P. has retired from the Council. The Minister has also appointed **Councillor O. Inman,** J.P., A.M.I.E.E., and **Alderman A. King,** J.P., as members of the Yorkshire Electricity Consultative. **Councillor R. Ambler** and **Alderman S. G. Bevan,** O.B.E., J.P., have retired from that Council on completion of their terms of office.

After being associated with the Hamilton, New Zealand, electricity undertaking for more than 40 years, **Mr I. Webster,** ASSOC.I.E.E., has retired from the position of city electrical engineer there. His successor is **Mr H. A. Jenkins,** B.SC., who has been assistant electrical engineer at Hamilton since 1947, and **Mr J. R. Shernon** has been appointed assistant electrical engineer in Mr Jackson's place.

We offer our congratulations to **Miss Vera Norvick,** the very energetic assistant secretary of the Electrical Association for Women, who has just been made a member of the Royal Institution.

Dr J. M. S. Risk, PH.D., C.A., F.C.W.A., A.C.I.S., has been appointed controller of accounts of the Brush Group Ltd., and a director of Associated British Oil Engines Ltd. He succeeds **Mr M. Tattersfield,** A.C.A., F.C.C.S., who is now deputy managing director of Brush Electrical Engineering Co., Ltd.

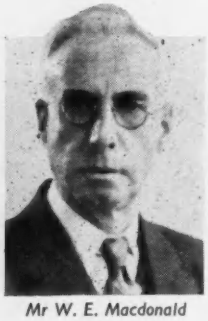
After 37 years with the General Electric Co., Ltd., **Mr A. E. Phipps,** deputy general manager of the company's Witton Moulded Insulation Works, has retired. At a farewell dinner party **Mr R. J. Kaula,** general manager of the works, presented him with a silver tea service and tray on behalf of his many friends and colleagues. Mr Phipps joined the G.E.C. as a chemist in the Carbon and Battery Works in 1917, and three years later, when the Witton Development Laboratories were built, he became first assistant in the Chemical Department. In 1928 he was transferred to the Witton Moulded Insulation Works to take charge of research, development and production of battery boxes, and was appointed deputy general manager in 1938. Mr Phipps is well known in the plastics industry and served as chairman of the Midland subsection of the Moulders Group of the British Plastics Federation in 1952 and 1953.

Mr A. E. Phipps, left, receives the present from Mr R. J. Kaula

Chairman of the board of the Detroit Edison Co. since May, 1944, **Mr Prentiss M. Brown** is retiring from that position at the beginning of next month. The executive vice-president of the company, **Mr Arthur S. Albright,** also retires on the same date.

Ekco-Ensign Electric Ltd. have appointed **Mr C. H. Dunkley** as their representative covering the London postal districts of W.1 and W.C.1. He will operate from the company's southern sales office at 45 Essex St, Strand, W.C.2.

Mr F. E. Richardson



Mr W. E. Macdonald

Miss Vera Norvick

At the Dagenham Dock works of Pritchett and Gold and E.P.S. Co., Ltd., **Mr A. W. Browne,** chairman of the company, presented a cheque and a certificate to mark the completion of over 25 years' service to **Mr E. Honey,** who has just been made a director. Our accompanying photograph, taken at the function, also shows on the left, **Mr E. C. Savage,** personnel Manager of Pritchett and Gold, who was also presented with a cheque and certificate.

Mr A. W. Browne, centre, with Mr Honey, right, and Mr Savage, left

Smart and Brown (Engineers) Ltd. announce that **Mr C. A. Patterson** has joined their Technical Sales Department as a lighting engineer. Previously he was with Benjamin Electric Ltd.

Miss Mary J. Cumming has been awarded the 10th Travelling Exhibition by the Caroline Haslett Trust, which enables holders to study some aspect of domestic electrification in another country. She is the senior demonstrator in the Clyde sub-area of the South West Scotland Electricity Board. Miss Cumming is to visit Finland to see how the work of the demonstrator is carried out in that country and the measures adopted to educate the Finnish housewife in town and country in the right use of electric power.

At the annual convention of the Association of Mining Electrical & Mechanical Engineers at Glasgow last week, **Mr B. L. Metcalfe,** B.SC., A.R.T.C., M.I.MECH.E., M.I.E.E., chief mechanical and electrical engineer to the National Coal Board, was formally inducted as president. New vice-presidents are Messrs **J. E. Ridley, B. H. Morgans** and **D. M. Wardlaw,** the latter for a two-year period. Two veterans of the Association, **Mr. A. B. Muirhead,** chairman of the Advisory Committee, and **Mr F. Beckett,** treasurer, retired from active committee work at the annual meeting, after long and devoted periods of service. The Association is to recognise these members officially at a later date with a suitable presentation. The new president, Mr B. L. Metcalfe, has been associated with mining engineering throughout his career. He began with Metropolitan-Vickers Electrical Co., Ltd., to whom he became chief of the mining section of the General Engineering Department. From 1940 to 1945 he was chief electrical engineer to Powell Duffryn, Ltd., and from then till 1948 he was technical director of the Brush Electrical Engineering Co., Ltd.

Mr B. F. Slater, G.I.MECH.E., G.I.MAR.E., late sales engineer for Borg and Beck Co., Ltd., has recently joined J. and H. McLaren, Ltd., in a similar capacity and will represent the company in the West of England.

Formerly planning and development engineer at the Norfolk sub-area headquarters of the Eastern Electricity Board, **Mr B. H. Robertson,** B.SC., A.M.I.E.E., has been appointed district manager for the Board's King's Lynn and Western District. Educated at Rossall and at Manchester University, Mr Robertson started with the Lancashire Electric Power Co., Ltd., with whom he served for six years. In 1930 he joined the East Anglian Electric Supply Co., and prior to nationalisation he was the divisional engineer for the Norfolk division of that undertaking.

Mr W. K. G. Allen has joined the board of Whessoe Ltd.

Mr A. E. Iliffe, director and general sales manager of Benjamin Electric Ltd. has returned to this country after a four months' business tour of the world. Whilst in New Zealand he landed what is claimed to be the biggest lighting fittings order ever given to a British company.

Mr C. A. Patterson

Mr B. L. Metcalfe

Mr A. B. Cowen, O.B.E., M.I.E.E., who is chairman of the Electricity Supply Commission of Southern Rhodesia, has been appointed as a member of the Federal Hydro - Electric Board for Rhodesia and Nyasaland which held its inaugural meeting on Tuesday last. The interim chairman of the Board is **Mr J. H. Lascelles,** who is a director of Rhodesian Selection Trust. Other members of the Board are **Mr P. H. Haviland,** a civil engineering consultant who was formerly director of irrigation in Southern Rhodesia, and **Mr L. G. Hunt.** The newly formed H.E. Board is authorised to establish the Kafue and Kariba hydro-electric projects.

Long-service awards were presented to three employees at Derby Power Station by **Mr W. Warren,** generation engineer for the Northern Group of the East Midlands Division of the B.E.A. **Mr H. S. Besant,** a shift control engineer, was presented with a sum of money collected by his colleagues to mark his retirement after more than 30 years' service. **Mr A. Allsopp** received a gold watch in recognition of 35 years' service and **Mr A. H. Humble** was presented with a wristlet watch to mark his 25 years' service.

Chief clerk to the chief accountant of the Midland Electricity Board when he retired in 1951 and entered Holy Orders, the **Rev. E. B. Gregory** has been appointed by the Queen to be Vicar of Santon, Isle of Man.

General J. E. S. Stevens, chairman of the Atomic Energy Commission of Australia, is shortly to arrive in Britain for discussions on atomic developments, particularly the application of atomic energy to industry. He is also visiting the United States and Canada.

OBITUARY

Mr J. W. Turner, of Stockport, district representative for the D.P. Battery Co., Ltd., died on 16 June. He had served with that company since December 1917.

Mr W. Hoult, B.SC., M.ENG., M.I.E.E., M.I.MECH.E., died on 17 June after a long illness. He was for some years a director of the former Mid-Cheshire Electricity Supply Co., Ltd., and earlier, was electrical engineer with Brunner, Mond and Co.

Mr Ernest O. Pollak, sales manager of Smart and Brown (Engineers) Ltd., died on 12 June. Born in South Africa in 1903, he was very well known in the electrical trade and before the war was sales manager of British Electric Domestic Appliances Ltd., manufacturers of "Mary Ann" vacuum cleaners and irons. Later he became Midlands area representative for Ferguson Radio and in the immediate post-war years served in the Atlas Lighting Division of Thorn Electrical Industries Ltd., subsequently joining Drubel Radio Distributors of Croydon. In 1952 he was appointed sales manager of Smart and Brown (Engineers) Ltd.

Mr R. Wilson Smith, whose death we noted last week, had been managing director of Drake and Gorham Wholesale Ltd. for some years until retiring in 1948, and had not been connected with Drake and Gorham Ltd., as was stated.

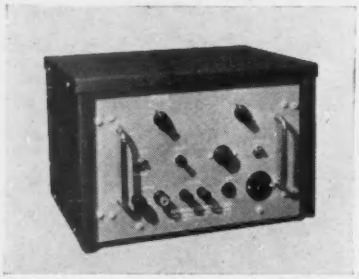
Mr W. H. Charlesworth, chief electrical engineer of Olive and Partington Ltd., of Glossop, died on 18 June.

Equipment for Industry

Testing "Sticky" Meters

WHEN testing indicating instruments for excessive friction, the normal procedure involves manual adjustment of the meter current whilst simultaneously observing the instrument dial. Although by this method meters in which the needle refuses to move may be detected, those instruments in which the friction is considerably less, the slight tendency to sticking will often be missed as it is impossible to adjust the current smoothly by hand. To overcome this objection, SERVOMEX CONTROLS LTD, Crowborough Hill, Jarvis Brook, Sussex, are now marketing a meter testing unit which is claimed to weed out such instruments in a simple and foolproof manner.

Designed originally for the company's own inspection department, the unit provides a maximum of one watt output for testing microammeters and milliammeters up to 10 mA d.c. and voltmeters up to 100 V d.c. The meter is connected across



The Servomex meter tester has a neat and attractive housing

the test terminals, to which a slightly negative potential is permanently connected to provide a small backward deflection. On pressing the test button, the meter current rises smoothly to its full scale value and then returns to the start. By this means it is possible to detect the pressure of small particles of dirt in the movement and similar conditions likely to lead to trouble later. A stabiliser unit protects the output from mains variations up to ± 10 % on normal a.c. supplies. Three rates of current rise are provided, to provide full scale deflection in 10, 30 and 100 seconds. Naturally, the slower the movement the finer the test, although 30 seconds is the sweep time recommended for all normal instruments. One unit is also provided with a repeat mechanism for batch testing. With this arrangement the test cycle is repeated indefinitely to enable the operator to inspect each meter in turn without having to restart the test at each time.

Swivelling Axle for Mining Transformers

RAIL mounted transformers used in mining usually have a long wheel base which can create considerable difficulty when negotiating the transformer round sharp bends in the mine track. A recent development of transformers manufactured by DENIS FERRANTI LTD, Royton, Oldham, Lancs, however, designed to obviate this difficulty, takes the form of a swivelling axle, which is fitted

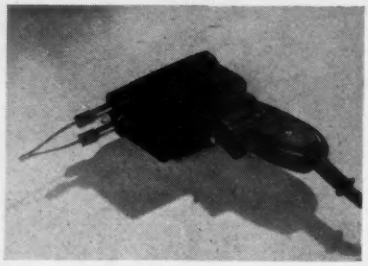
Close up of the swivelling axle now fitted to Denis Ferranti mining transformers

to both ends. Each axle may then swivel through a total angle of 15°, enabling such transformers to negotiate curves of mean radii as low as 17 ft 6 in. without difficulty. Now being fitted as standard to all this company's mining transformers, the axles are adjustable for different rail clearances in the usual way, and draw cars are fitted.

Gun for high speed soldering

MANY small soldering operations, whether on a mass production scale, in the laboratory, or in repair and maintenance work on site, usually involve the soldering iron being permanently connected to the supply, a considerable waste of energy in the intervals when the iron is not being used. Designed to minimise this waste is a speed soldering gun now available in this country from the MARTIN AGENCY, 43 London Rd, Kingston-on-Thames, Surrey. Known as the "Audion," the gun operates on the transformer welder principle, utilising a small looped element as a bit. When energised, a current of some 500 A, supplied from the secondary winding of a special transformer incorporated in the gun, flows through the bit, bringing it to soldering temperature in about 5 secs.

Control of the gun is effected by a normally open, trigger type switch inserted in the primary winding, thus ensuring



The "Audion" speed soldering gun is particularly useful where space is limited

that as soon as pressure is removed from the trigger the circuit is opened. As the tip has a low thermal capacity it cools almost as rapidly as it heats up, thus making the gun safe to replace in the tool bag or pocket almost immediately after use. The small radiating surface area minimises heat loss and makes for a high heat transfer to the solder and joint. Moreover the small tip, which is replaceable, may be formed to fit the particular job in hand. Suitable for standard 200/240 V a.c. supplies, the gun has a consumption of 100 W. It is light in weight, and housed in an impact resisting case.

Cold Pressure Welding Tool

A RECENT development in the application of cold pressing welding is seen in a cold pressure tool now being produced by G.P.A. TOOLS AND GAUGES LTD, and being marketed by the GENERAL ELECTRIC CO., LTD., Special Products Dept, Magnet Hse, Kingsway W.C.2. The tool is intended for butt welding wires, particularly in copper and aluminium, the join obtained, without heat, being stated to have the mechanical strength and electrical conductivity of the parent metal.

Operation of the tool is straightforward and may be carried out by unskilled

This is the smaller model G.P.A. cold pressure welding tool for butt welding wires

operators. The wires are inserted into split tapering jaws and gripped tightly. After their ends are cut square by a cutting mechanism incorporated in the tool, the wires are brought hard up together, with sufficient pressure to effect a weld. Part of the metal is displaced laterally, forming a flash which may be trimmed in any manner that may be convenient. No flux, chemical or gas is required in the process. Two sizes of tool are being made, for wire diameters, from 0·036 in. to 0·064 in. and 0·080 in. to 0·144 in. respectively.

Volex Cables

NEW departure for VOLEX ELECTRICAL PRODUCTS LTD., Salford 6, Lancs, makers of accessories and shades, is the introduction of a range of insulated cables.

The following types are available: v.i.r. cable taped, braided and compounded to B.S.S. No. 7, 1953, Table 22, single conductor, red and black, in all sizes from 1/·044 to 19/·064 in.; t.r.s. cable to B.S. 7, 1953, Table 26, single, twin flat, twin with earth continuity and three-core flat. All sizes from 1/·044 to 7/·064 in.; and polythene insulated p.v.c. sheathed cable in single, twin flat with earth continuity

The new cables are supplied on attractive reels

and three-core flat in all sizes from 1/·044 to 7/·064 in.

For ease of handling and attractive display all cables are wound on robust multi-coloured reels and will be distributed through wholesalers as are other Volex products.

1954 "Summit" Cleaners

THE hand, cylinder and upright "Summit" cleaners marketed by SLOAN ELECTRICAL CO., LTD., Slonetric House, 31-33, Bondway, Vauxhall, S.W.8, have been improved in appearance and contain a number of new features.

The hand model which sells at £9. 6s. 8d. including tax is finished in brown and cream. It weighs 9 lb and has a handle embodying a rubber grip and convenient on/off toggle switch. 21 ft of strong three-core t.r.s. cable is supplied. Accessories include a brush, carpet and crevice nozzles and a rigid extension tube. The cylinder model costs £12. 0s. 4d. (inc. tax) has its body covered in light brown crocodile-finish leather cloth with nickel-plated end caps. A special swivel is fitted to afford easy movement of the flexible braided hose whilst a foot press switch now replaces the on/off toggle switch and the motor end cover has been designed to enable the cleaner to stand upright for easy storage. Apart from normal accessories supplied, optional extras include *inter alia* an 8½ in. metal nozzle fitted with a bar magnet to lift pins, etc., from the floor, at 18s. 3d. (inc. P.t.).

The upright model vacuum cleaner in its attractive cream finish and brown dust bag has a handle shaped to afford ease of manoeuvrability. Its dust bag is held in front of the cleaner, and the motor casing has a rubber buffer to protect walls and furniture. Price is £16. 12s. 9d. tax paid with attachments including hose, extension tubes, corner and wall brush, crevice and carpet nozzles, and deodoriser attachment costing £2. 19s. 8d.

News about Storage Heaters

PRICE of the Nightstor 1½ kW storage heater has been reduced by 5s. to £12. 5s. say the GENERAL ELECTRIC CO., LTD., Magnet Hse, Kingsway, W.C.2. The firm also announced that it has introduced two new Nightstor models, a "Minor" and a "Major" model with loadings 1 kW and 2¼ kW respectively. Prices are £11 for the "Minor" and £15 for the "Major."

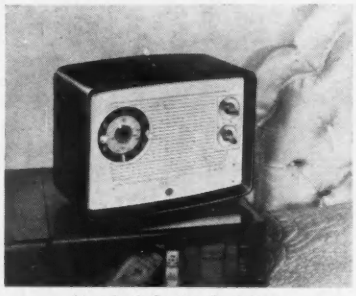
THERMODARE (GREAT BRITAIN) 79/80 Petty France, S.W.1, announced reductions in the prices of their thermal storage heaters as follows, with effect from last Monday, 21 June: 1 kW model, £11.; 1½ kW model, £12. 10s.; 2 kW model, £14.

New "Radiotime" by Ekco

NEW Radiotime model A222 receiver has been announced by E. K. COLE LTD., Southend-on-Sea, Essex.

Housed in a brown and cream plastic cabinet 9 7/8 in. high, 13 in. wide and 6¼ in. deep, the new receiver combines a switch tuned radio with a Smith's self-starting, mains-operated clock, complete with automatic time switching and alarm facilities.

For 200-250 V a.c. the New Radiotime is a transportable four-valve receiver incorporating pre-selected tuning of three



New Look for the Radiotime

medium and one long wave station by rotary switch. It has a 6 in. speaker which handles a 2½ W output and built-in twin-frame aerial. Extension sockets allow either entertainment or radio alarm in more than one room.

A unique feature of this model is that it can be set to "switch on" to a pre-selected radio programme, and then after a short interval sound a buzzer alarm to wake the extra heavy sleeper. A further outstanding feature of model A222 is that it can be used when retiring to bed with the knowledge that it will switch itself off after a pre-determined period. List price is £15. 17s. Purchase tax is £5. 3s.

Immersion Heaters For Easy Wiring

A NEW basic range of automatic immersion heaters with 2¼ in. BSPT heads with many features designed to aid the wireman has been announced by the GENERAL ELECTRIC CO., LTD., Magnet Hse, Kingsway, W.C.2. They are going to be made in 12, 18, 23, 27 and 30 in. lengths.

Easy-wiring features of these heaters are (i) a short wire route inside the head,

For the Electrical Trade

•

(ii) a plastic barrier separating phase and neutral wires and preventing the thermostat rotating within the heads, (iii) a slot in the terminal cover which brings bare earth wires straight into the earth terminal, (iv) a bush made of resilient rubber, (v) a head projection of only 2¾ in.

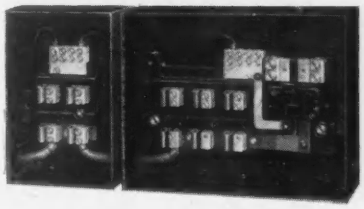
With these heaters it is not necessary to disturb the wiring when removing the terminal cover whilst thermostats sold separately can be filled on site in the heaters in a matter of seconds. Circular tubes can be easily fitted on site by means of three screws.

This basic range of G.E.C. immersion heaters will be augmented by horizontal non-automatic heaters with a 1¼ in. BSPT head available in 2 and 3 kW loadings. A full range of locknuts, sweating flanges and bolt-on flanges is available.

Wylex "Extenso" System

TO simplify the planning of an installation and to allow for easy extensions is the idea behind the Wylex

A two-way "Wylex" extending fuse panel looped to the 3-way master unit



"Extenso" system introduced by GEO H. SCHOLES AND CO., LTD., Wylex Works, Wythenshawe, Manchester.

The system keeps initial installation costs down by providing full facilities for future extension of the installation.

Basically the system consists of 2 units, a three-way master 60 amp switch fuse control unit and secondly a two-way non-switched fuse unit both with provision for looping. When the extension is required the 2-way extending fuse panel is looped in from the 3-way master unit. Both metal clad or all-insulated varieties are available designed either for rewirable or H.R.C. cartridge fuse.

PROBLEMS AND PRACTICE

In Engineering

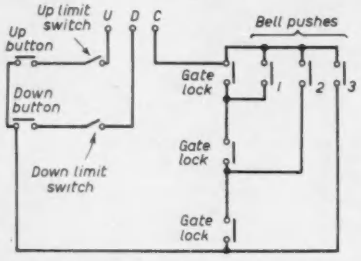
Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

The Missing C.T.

YOUR correspondent E. A. Robbins, draws welcome attention to the necessity for having a neutral c.t. in a balanced earth fault protective circuit for a four wire system, as this requirement is often overlooked by consumers who may not be familiar with recognised switchgear practice. The necessity for a neutral c.t. becomes even more manifest if a sensitive earth fault relay is employed, instead of a direct acting trip. For example, if the relay is set at 10%, then it requires only 10% out of balance neutral current to cause operation, in other words the effective relay setting is reduced to zero.—*J. V. O'Rourke.*

Lift Testing

WHEN called to repair a lift in which a gate is found open, it is necessary to test each gate separately, if there is no obvious open circuit. By shorting out each gate-lock as shown in the diagram, the faulty gate can be quickly eliminated. For



Typical lift circuit showing application of bell pushes for gate lock testing

this purpose bell pushes are to be preferred. Although two men are then required for testing (one operating the lift control and the other the bell pushes), they remove the danger of switches which might inadvertently be left on. To test the panel we inserted a push between C (common) and U or D. These bring in the contactors, by-passing limit switches, lift controls and gate locks and, again, a switch here would leave greater room for danger. The circuit, although only showing two buttons, two limits and three gates, can be extended at will.—*D. F. W.*

Plug Wiring

THE following account may serve to emphasise the need for small industrial power tools to be connected up by experienced men rather than leaving it to the casual operator who wants to use the tool in a hurry. I was sent to a factory (engaged on war production at the time) to attend to a bench drill which the operator declared was running slow. The factory had a maintenance department who carried out all repairs, as far as possible, to electric motors and machines.

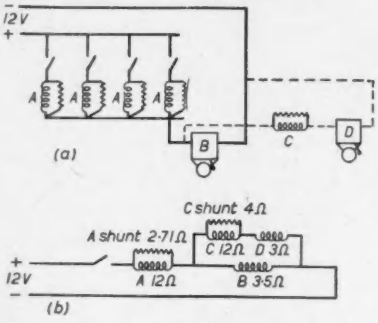
It was a single-phase machine, 250 V, 50 c/s, and after giving a "Megger" insulation test, which was satisfactory, I checked the pressure at the 15 A, three-pin switch socket into which it was plugged, but this was in order. On checking the connection from the motor to the plug, via a three core rubber covered flexible, however, I found that the neutral conductor had been connected to the earth pin of the plug. A difference in earth potential was the cause of the drill running slow. If the appliance had been connected up by an experienced person of course, the trouble would not have arisen in the first place. —*J. H. Robinson.*

Bell Circuits

THE problems of low voltage bell and signal systems are not often encountered in the general line of electrical work, but it does occur that awkward problems can arise unexpectedly, as was the case recently in experience.

In a private nursing home of four storeys, each floor had a number of bedrooms each equipped with a call push connected to its separate moving armature indicator and common bell, situated on an indicator board, one board on each floor, as shown in (a). Thus each floor had its own signal system which was adequate during daytime working hours, but through the night it was not always possible to hear the sound of a bell call from any floor when sitting in the staff rest room.

The connection of a common bell in the staff room was not a practical solution since the circuit would then be completed to all floors by the closure of any one bell push, so it was proposed to wire a separate bell in the staff room for each floor indicator board. To show which floor bell was operating, four moving armature indicators were to be series connected to their respective bells, as shown in (a) by the dotted lines. At this stage difficulty was experienced insofar as the new bells and indicators would cause unequal distribution of voltage, since it is rarely possible to match all coils to produce perfect conditions in the circuit. To consider the case of the first floor indicator board and master bell indicator, the resistances of the floor indicators. A floor bell B and master indicator C in series with master bell D, of values shown in (b), caused the voltage distribution from the 12 V battery to be approximately



Circuit of bell installation is shown in (a), together with a diagram (b) of resistance values

9·6 V for floor indicators A, but only 2·4 V for the parallel resistance group B, C, D, and consequently insufficient for their efficient operation. As increase of volts would not necessarily give satisfactory results the connection of a balancing shunt resistance across each coil was required to equalize the voltage between the two groups, but the question of distribution between coils B, C, D had also to be considered.

The first step therefore was to equalize the resistance of coils C and D, by shunting the former's 12 ohms with a 4 ohm resistor. By this addition the combined resistance of group B, C, D was now 2·21 ohms, and shunting each coil A by a resistor of value 2·71 ohms the circuit resistances were balanced out for equalized distribution. The contact resistance and cable resistances were not included.

With the final circuit as shown in (b) the main current was $12\text{ V} \div (2{\cdot}21 \times 2)$ ohms, giving 2·71 amps, the voltage distribution then being Coil A, 6 V; Coil B, 6 V; Coil C, 3 V; and Coil D, 3 V. Having calculated a solution; the only question now was to make up the requisite shunt resistances. This was done by using a "Nichrome" 1 kW spiral fire element, this element being divided into lengths of the requisite value.

By trial it was found that the circuit now operated satisfactorily except that insufficient current was available for sharp reaction. By increasing the voltage to 24 V at the battery each coil would be operating at a more suitable level although the current in this case would be some 5·4 amps main. Fortunately the wiring was metal sheathed and of sufficient section to carry this load, so that the voltage was increased to a level below 24 V at which point satisfactory operation was obtained.—*J. R.*

POWER SUPPLY Statistics

MAY

LAST month's record of plant commissioned by the B.E.A. showed a considerable improvement over that for earlier months this year. The total stands at one turbo-alternator and four boilers, the former being a 60 MW set for Carrington generating station in the N.W. and Merseyside Division. Of Metropolitan-Vickers manufacture, this set is the second for the station, and is powered from 360 klb/hr capacity Babcock and Wilcox boilers, of which three have been commissioned so far.

The N.W. and Merseyside Division also benefits from two of the four boilers commissioned. One of these, a 360 klb/hr unit is at Chadderton station. It is by Simon-Carves, and is the second to be commissioned. The other boiler is recorded at Roosecote, this being the station's third so far. Of Yarrow manufacture, it has a steam raising capacity of 300 klb/hr. Cliff Quay Station, Eastern Division, is another station recording a boiler commissioned. It is a Babcock and Wilcox 365 lb/hr unit, operating at t.s.v. conditions of 635 lb/sq in., 850° F. To complete the list is Nechells "B" Station, Midlands Division, where a further boiler now brings the number at this station to eleven, leaving only one remaining before the generating plant commissioning is completed. An International Combustion unit, the boiler has a capacity of 230 klb/hr of steam. Readers will recall that the station was recently described in the ELECTRICAL TIMES (25th February issue) and was opened by the Lord Mayor of Birmingham last month.

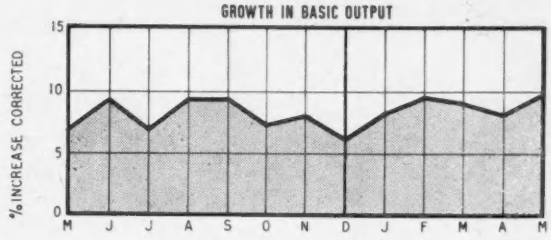
The total installed capacity of the B.E.A. thus stood at 18,697 MW at the end of May, an increase of 56 MW over the month. Since the corresponding period last year, the Authority's capacity has risen by 1,514 MW, 8·7%.

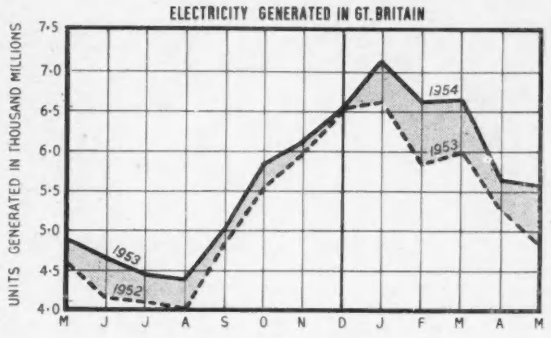
Sales of energy by Area Boards last month were conspicuous for the considerable increase over those for May last year. In only two cases are gains of less than 10% recorded and these, at 9·5% and 9·7%, fall little short of that figure. Nationally, sales of energy were 14·6% higher in May this year than last. After correction for the temperature difference (this year it was colder) and slightly greater number of effective working days, the rise in sales is seen to be 9·6%, the highest monthly increase since July 1951. The North of Scotland H.E. Board also had energy sales 10·9% greater than the same month last year.

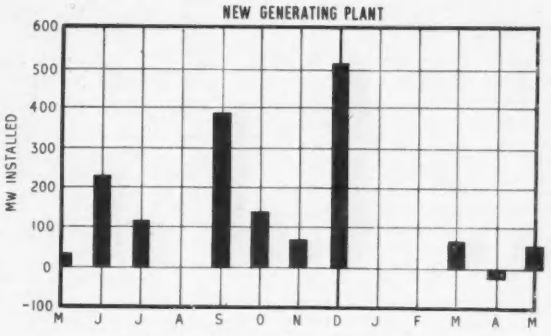
Units generated during the month totalled 5,592 millions, to which the B.E.A. contributed 5,489 millions and the North of Scotland Board 103 millions. Of the total, 5,489 million units were generated in steam stations and 92 million units in hydro stations. The total energy sent out amounted to 5,246 kWh, 94% of that generated.

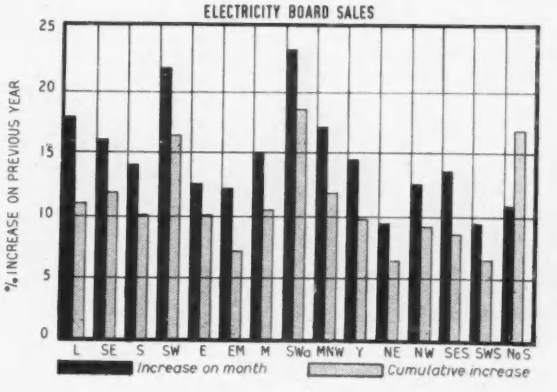
B.E.A. Sales to Area Boards in May

Board	May Sales in million units	% inc. or dec. on May 1953
London	456·2	+17·8
South Eastern	274·6	+16·1
Southern	323·9	+14·1
South Western	168·2	+21·9
Eastern	447·5	+13·6
East Midlands	389·0	+12·2
Midlands	531·0	+15·1
South Wales	325·1	+23·2
Merseyside and North Wales ...	304·1	+17·0
Yorkshire	514·1	+14·5
North Eastern	305·6	+ 9·5
North Western	561·8	+12·3
South East Scotland	106·1	+13·7
South West Scotland	252·3	+ 9·7
Direct Sales by B.E.A.	93·7	+21·4
Grand Total	5,053·2	+14·8









NEWS OF THE WEEK

Pollution from Dunston Power Station

Newcastle Health Committee may take Legal Action against B.E.A.

ACTION is being taken by Newcastle-on-Tyne's Health Committee against both the B.E.A. and Northern Gas Board in an effort to abate alleged atmospheric pollution. The committee has decided to take legal action against the B.E.A. about grey dust which is said to fall on the west end of the city from Dunston power station, unless something is done within five months.

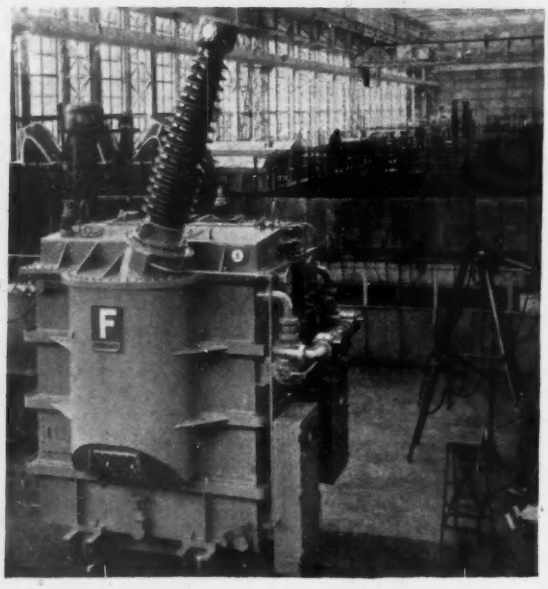
The local M.P., Mr E. Popplewell, has raised the matter in the House of Commons on a number of occasions in recent months. In April he elicited an explanation of the efforts being made to prevent air pollution from Dunston, from Mr L. W. Joynson-Hicks, Parliamentary Secretary to the Minister of Fuel, but gave notice at the end that he was not satisfied and intended to raise the matter on the Adjournment. On that occasion, Mr Joynson-Hicks gave the efficiencies of the various chimneys but commented that the real solution of the problem lay in the gradual exchange of load to more modern plant. He had little hope that it would be possible to insert the electrostatic precipitators (now operating in chimneys 5 and 6 at an efficiency of 97%) into the old chimneys 1 to 4. Only recently another Newcastle M.P., Mr E. W. Short, was assured that enquiries were being carried out. Of more direct concern to the Health Committee was Mr S. Hastings' query in April. He advocated special consideration of risks to health from sulphur gas emissions from power stations. The Minister of Housing said he understood the Committee on Air Pollution was already examining those problems and were in close touch with the Medical Research Council.

The Health Committee is also to ask the Beaver Committee, investigating air pollution, to visit Newcastle. At the beginning of May Sir Hugh Beaver led a party on a fact-finding tour of the country, but his itinerary did not include Newcastle. It has also been agreed to press on with the scheme to have clauses in the city's next Parliamentary Bill enabling it to declare smokeless zones.

Action in the case of the Gas Board is that three months' notice is to be given concerning the abatement of smoke at the Board's by-product works.

Plant for Garrison Dam

ON their way to the U.S. via Montreal at present are three 230,000 V Ferranti transformers forming the first 100,000 kVA bank for America's Garrison Dam project in N. Dakota. The equipment was loaded aboard the *Manchester Regiment* at Manchester docks last week. The company is supplying a total of nine 33,333 kVA, single-phase, 60 c/s 13,200/230,000 V generator transformers forming three 100,000 kVA 3-phase banks. The equipment is being supplied to the U.S. Army Corps of Engineers and total value of the contract is $880,000. As stated in previous issues the power plant is located at the western end of the Garrison Dam on the Missouri River about 70 miles from Bismarck. Generating plant comprises five 80,000 kW hydro-electric units.



One of the Ferranti transformers for the Garrison Dam project in the test laboratory at Hollinwood

E.P.E.A. MAY TERMINATE N.J.B. AGREEMENT

NOT having secured any acceptable progress towards its claim on behalf of technical staff in the Electricity Supply Industry, the Electrical Power Engineers Association has tendered six months' notice to the B.E.A. under Clause 47 of the National Joint Board agreement to terminate that agreement and the salary schedules related thereto. There is provision under the N.J.B. agreement, in the event of failure to agree within the negotiating machinery, for any dispute to be remitted to the Industrial Court or any other agreed tribunal for arbitration, any award made being binding on the Electricity Boards, the Association and its members. Termination of the agreement will, at the expiry of the 6 months' notice, also terminate that clause.

In giving notice of this step, the E.P.E.A. point out that there is still time, during the period of notice, for discussions to be resumed on a more acceptable basis to the Association and its members. The special sub-committee, which was set up to consider the representations, has not been disbanded, we understand.

£2 million Order from U.S.

THE British Thomson-Houston Co., Ltd., have secured yet another valuable contract for mobile fire control radar, type A.A. 3Mk7. This is the third order obtained comparatively recently and is valued at $5,700,000, or £2,020,000, bringing the total value of all three contracts up to over $14 millions (£4,975,000). The first two have been completed and delivery of equipment covered by the latest order will begin almost immediately. The contract was placed by the U.S. Army European Headquarters Command, and all equipment is for N.A.T.O. countries.

Brighton's Trolleys show Profit—Why Scrap Them?

IN view of the Transport Committee's strong recommendation that Brighton should scrap her trolleybuses it comes as something of a surprise that the trolleybuses provided a surplus of £7,601 during the year ending 31 Mar. last, whereas the motor buses incurred a loss of £13,013. Such figures, appearing in the Transport Undertakings annual accounts issued last week, do not seem to substantiate the decision. Another factor which does not bear out the Committee's recommendation is that working expenses of the trolleybuses per vehicle mile amounted to 25·986d. whereas the corresponding figure for motor buses was 26·963d. On the other hand the trolleybuses are at present running on the busier and more productive routes and it may be reasonable to assume that the motor buses would give a better return on those same routes, despite the fact that their fuel costs would increase on the hilly runs involved.

The situation is the more confused by such matters as rising costs, operation of two different systems of transport, incomparable routes, the need to extend routes and, probably most important, the existing agreement between the Corporation and the District Omnibus Co. It may be recalled that the Transport Committee's recommendation (reported in our 10 June issue) was not supported by figures.

Figuring again in defence of the trolleybus, B.E.A.M.A. has pointed out that it is quite incorrect to say that the vehicles were worn out after 15 years. Average life of a trolleybus was 20 years, double that of a diesel bus, and it could be overhauled and fitted with a new body at a cost of £2,500 to enable it to run another 20 years. B.E.A.M.A. state that Brighton could learn from other transport undertakings where with integrated services of trolley- and diesel-buses, the trolleys made surpluses to subsidise diesel operation. America is cited to repudiate the suggestion that trolleybuses were outdated. Trolleybus fleets in the U.S. had doubled in the past decade and are being expanded. An allegation that the decision to scrap the trolleybuses was forced on the Corporation's Transport Committee by the Brighton, Hove and District Omnibus Co. has been strongly denied by the company.

Postscript to the above story is that Bradford has just approved £9,800 expenditure on overhead wiring for extending a trolleybus route.

Radio and TV Sales almost Stationary

THE decline in the sales of radio and television sets since the beginning of the year may have been arrested. Figures issued last weekend by the R.T.R.A. show that the fall was only very slight during April. The Association points out that a feature of sales in recent months has been the continued demand for radio receivers. The average number of radio sets sold per shop in April was 8·42 compared with 8·56 in March and 5·68 in April 1953. Corresponding figures for TV sales were 5·36 last April, 5·42 in March and 10·22 in April 1953.

Radio sales continue well above last year's figures but TV sales are well below 1953's pre-coronation rush.

Lord Mayor of Newcastle, Ald. R. Mould-Graham, speaking during the opening of the Parsons Centenary Exhibition last week. On his right is Dr C. I. C. Bosanquet, rector of King's College, and on his left Lord Ridley, Miss Rachel Parsons and Sir Claude Gibb, chairman and managing director of C. A. Parsons. The exhibition at King's College's Stephenson Building

Progress in Tin Research Last Year

ACTIVITIES of the Tin Research Institute, whose Annual Report for 1953 has just been published, included last year the development of a new alloy which is likely to have considerable appeal in the electrical appliance industry. It consists of copper manganese and tin, being developed out of work originally directed at meeting the shortage of nickel. The new alloy is almost white, taking a high finish, and is suitable for rolling stamping and similar operations. Industrial trials are in hand, although it will be some time before a clear picture of its usefulness may be obtained.

Investigations with tin aluminium bearing alloys have made considerable progress, and samples of three different types of bearing are being supplied for engine and machine trials on a practical scale. Electro-deposition forms a large part of the Institute's work, and activities in this section have been concerned with both fundamental examinations of new alloy coatings and alternative methods of plating alloys already well known.

Papers at Annual Mining Convention in Glasgow

IN HIS presidential address to the Association of Mining Electrical and Mechanical Engineers in Glasgow last week, Mr B. L. Metcalf advocated the formation of one comprehensive mining engineering specialist branch and one comprehensive engineering branch, splitting at lower levels into sections. There was at present, he said, a tendency to set up small semi-independent branches of specialists without defining their relationship to other branches. Mr Metcalf said there had been too much in-breeding on the engineering side and two little infiltration of new blood from other industries. He repudiated the view that there should be one training course for all engineering entrants to mining. The president called special attention to the new central engineering establishment to be built by the N.C.B. and asked for the closest collaboration from Universities.

The subject of accidents in mines was dealt with by Mr A. E. Crook, H.M. Principal Inspector of Mechanical Engineering in Mines and Quarries. Inadequate maintenance was responsible for 40 of 68 accidents analysed, he said. Proper maintenance was essential. Mechanised mining had resulted in a great increase in the number of machines in use, which meant greater responsibility for colliery engineers and electricians. He suggested that statutory daily examinations of external parts of winding equipment should be supplemented by special examinations held at longer intervals.

At the business meeting a resolution was passed concerning the appointment of electrical and mechanical engineers. It stated that whilst recognising the authority of the Colliery Manager, the meeting deplored the Minister of Fuel's attitude to their request that the Colliery Electrical Engineer and Mechanical Engineer should be appointed by the owner and not by the manager.

Appointment of the Association's new President is reported on page 959.

OFFICIAL PUBLICATIONS

PATENTS, DESIGNS AND TRADE MARKS. 71st report of Comptroller-General for 1953. (See page 967.) H.M.S.O., 1s. 3d.

FIRE RESEARCH, 1953. Report of Fire Research Station published by H.M.S.O. for D.S.I.R., 2s. 6d.

STATISTICAL DIGEST, 1953. Ministry of Fuel and Power. H.M.S.O. £1. 1s.

Annual Exhibitions are not sufficient

PERMANENT exhibitions were now needed to keep our products to the fore, Lord Bennett, of Edgbaston, said at the opening of the new Birmingham Engineering Centre last week. It was not sufficient to have an exhibition just occasionally when trying to meet the intense competition all over the world. There was undoubtedly great value in the annual shows but something more was wanted.

The Engineering Centre is a permanent exhibition of British goods catering for some 200 exhibitors, and offering numerous facilities for meetings and the carrying on of business.

A.S.E.E. ELECTRICAL EXHIBITION WILL BE ALL-BRITISH

IF THERE were any doubts previously about the high repute of the A.S.E.E.'s Electrical Exhibition there can be none now. Its importance has been recognised overseas not merely by the foreign buyers who are known to attend in large numbers, but also by manufacturers. Following the successful exhibition of last March, the organisers received several requests from overseas manufacturers to exhibit at the 1955 show. Applications came particularly from Germany. The question of foreign participation has been fully considered and it has now been decided to keep the exhibition as an all-British function, Mr P. A. Thoroughgood told the ELECTRICAL TIMES last week.

Meanwhile plans for next year's display, when the theme will be motive power, move forward smoothly. As previously stated in these columns, the whole of the ground floor will definitely be taken to accommodate as many firms requesting space as possible. Other suggestions and proposals for expansion and betterment are being considered but no decisions have yet been reached.

Lighting in London, Hong Kong and at Sea

DETAILS of three lighting installations have recently come to hand from varying situations or localities. Two involve very similar surroundings but are half the world distant, while the third concerns the *City of Durban* which sailed on her maiden voyage at the beginning of this month.

The system installed in the Mercantile Bank of India's new premises in Hong Kong has aroused great interest in the colony, we hear. In the main Banking Hall there are two rows of ten recesses in the concrete ceiling. Each recess has been lined with white asbestos board reflectors concealing Quickstart control gear and contains six 3 ft 30 W or 4 ft 40 W white tubes. The openings were covered by Louverene panels braced by clear Perspex strips and arranged to slide open to give access for cleaning and maintenance. Ceiling mounted fittings have been used in the mezzanine offices. They house a 5 ft 80 W double-life white tube behind a reeded Perspex diffuser, and the control gear. All these fittings were supplied by Thorn Electrical Industries Ltd. through their representatives, Jardine Engineering Corporation Ltd.

Back in London, the British Thomson-Houston Co's latest all-Perspex fluorescent diffuser light fittings were used in Sedgwick Collins and Co., Ltd's new offices. Over 100 of these fittings were used to give the unusually high level of glare-free illumination of 30 lumens per sq ft. There is a false ceiling of Cullum's Acousti-Celotex sound absorbent boarding. Architects were Gunton and Gunton and contractors were Electrical Installations Ltd.

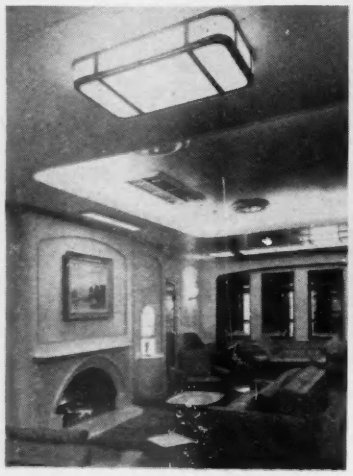
No less than 38 designs of special decorative fittings were involved in the lighting aboard the *City of Durban*, carried out by the General Electric Co., Ltd. Fluorescent tubes in cornices were combined with tungsten lamps in the restaurant, verandah cafe, dance space, writing room and drawing room. In the last there was additional direct fluorescent lighting from two laylights each housing three 2 ft 40 W tubes. Cornice tubes overlap to provide continuous lighting and gear is accommodated behind the cornice. Louvre fittings with parabolic reflectors were installed for picture lighting. To convert the ship's 220 V d.c. supply to 220 V 50 c/s a.c. for fluorescent lighting, the same company provided two (one stand-by) 10 kVA motor-alternators.

The First Half-Century

In this quarter of Greater London a vast scheme of rapid passenger transit is being pushed forward under the control of the Underground Electric Railway Co. of London, of which perhaps Mr Charles G. Yerkes may be described as the moving spirit. The facilities which these new lines will provide are simply enormous compared to those at present afforded. It has been estimated that the new tube line will have a carrying capacity of no less than 327,000,000 passengers per annum, and this does not take any account of the electrified District Railway, expected to be able to carry another 40 million. Mr Perks' evidence, given before the London Traffic Commission, sounds almost too good to be true. According to him, one will be able to go from Hammersmith to Piccadilly in 20 minutes, and from Piccadilly to King's Cross in less than eleven minutes, or a total of 31 minutes for all the way from Hammersmith to King's Cross—and this journey would cost 2d.—*From our issue of 23 June, 1904.*

GOLF MEETING CHANGED

WE have been informed by the hon. secretary that due to uncontrollable circumstances the S. Eastern Area Finals in the E.I.B.A.'s National Golf Championships will now take place at the East Brighton Club on 23 July. The meeting had previously been arranged for 9 July at Eastbourne as we reported last week. Cards can be obtained from Mr E. R. Prickett at 59a Middle St, Brighton.



Office lighting in a City of London office (left) and in Mercantile Bank of India, Hong Kong (below)

Left: Drawing Room of "City of Durban"

Monopolies Group Named

CHAIRMAN of the Monopolies and Restrictive Practices Commission has appointed a group of eight members, under the chairmanship of Mr D. A. S. Cairns, to continue the enquiries concerning the supply and export of electrical and allied machinery and plant. It will be recalled that the 1948 Act was amended last year to all the Commission's work to be divided between groups of not less than five members.

C.D.A. Coming of Age

OUR congratulations are due to the Copper Development Association who have recently celebrated their 21st birthday. A glowing tribute to the useful work done by the Association in varying fields of activity was paid by Lord McGowan, at an anniversary lunch at Kendals Hall, Radlett.

Mr. R. L. Prain, chairman of the council, announced the setting up of a trust fund to secure the future of the Association. The fund is to be a Rhodesian trust, administered in Rhodesia by trustees representing the donors and the Association, and would amount to not less than £100,000.

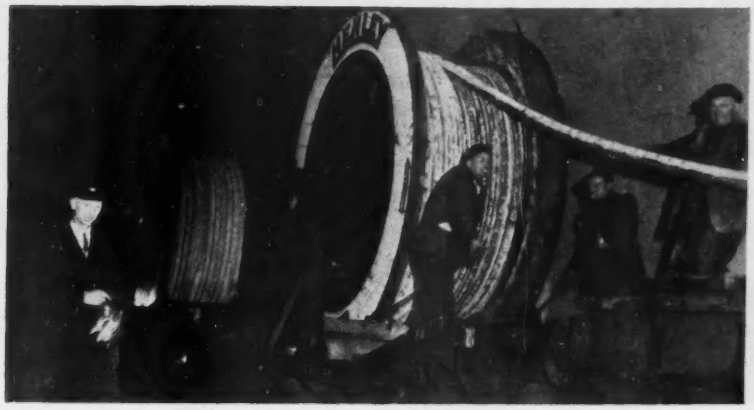
Inventions and Patents during 1953

AMONG trends of invention in this country during 1953 greater interest has been shown in the production of non-metallic material which exhibits permanent magnetic properties and which allows magnetisation perpendicularly to the plane of a sheet of the material. This is contained in the 71st report of the Comptroller-General of Patents, Designs, and Trade Marks, for 1953. Activity has been maintained at a high level throughout the year, we are told, although there have been fewer new developments. The production of magnetic "memory storage" devices for electric computers, and the application of magnetic recording of electric signals, and signals used for the control of machine tools, have also received attention. Development of cathode ray tubes and systems for colour TV has been actively pursued, while continuing interest has also been shown in all-electronic telephone exchanges.

During the year a total of 36,401 applications were made for patents, being 3,259 more than in 1952, and the number sealed was 17,882, compared with 21,380 the previous year. Fees from patents amounted to £799,264, as compared with £789,206 in the previous 12 months, while total income of the Department was £981,269, a rise of £13,758.

ELECTRICAL AND OTHER PATENTS ACCEPTED IN 1953

Subject	Primary feature of invention		Subsidiary	
	1952	1953	1952	1953
Incandescent electric lamps	42	34	23	19
Electric heating	151	104	72	54
Lamps for lighting, etc., details	69	47	28	19
" " " " kinds of	50	53	30	20
Steam generators	20	34	15	12
" separators and superheaters	16	9	9	12
Turbines, etc.	157	137	105	91
Dynamo-electric machines, etc.	211	151	126	76
Converting electric currents	181	125	68	53
Electric supply systems	310	251	184	127
Conducting electricity	121	94	34	33
Measuring electricity	312	291	127	113
Electric couplings, etc.	174	169	53	53
Electrolysis	87	66	35	20
Electric motor control systems	110	70	71	65
Electric switches	305	258	163	150
Electric signalling systems	169	112	76	81
Indicators and burglar alarms	18	10	11	10
Electric telephones, etc.	281	226	63	46
Electric discharges or vapours, tubes, etc.	502	344	86	60



Our illustration above should remove any misapprehension which might have arisen following our article (last week) concerning the manufacturers of the power cables for the Manchester Wath railway electrification scheme. With the opening of Woodhead tunnel, W. T. Henley's Telegraph Works Co., Ltd's contract for the installation of 33 kV feeder cables is complete. About 52 miles of 33 kV 3-core screened S.L. type, single-wire armoured and served cables have been installed. Henley Contract Dept. engineers also installed 78 miles of 4-star and 7-star quad pilot cables supplied by S.T. and C. Co.

Field Day for Head Office at G.E.C. Sports

GLORIOUS weather favoured the 29th annual sports and gala of the General Electric Co., Ltd. held at their Wembley sports ground last Saturday, which was attended by a large crowd. For the Head Office contestants, it was a veritable field day, and, collecting a total of 42 points, they won the Leslie Gamage trophy for the leading London establishment for the sixth consecutive year. Noteworthy was the record of 4 minutes 30.4 secs for the one mile flat scratch race achieved by J. Hovell, of Head Office. Children's corner again provided attractions for the youngsters while the other sideshows were well supported. After the presentations of cups and prizes by the Hon. Mrs. Leslie Gamage, dancing in Hirst Hall concluded an enjoyable day.

NEWS IN BRIEF

A 75,000 kVA, ON/OFB, 132,000/66,000 V, 3-phase, 50 c/s Ferranti transformer has been delivered recently at Dunston power station.

Yearly Court of Governors of Royal Commercial Travellers' Schools took place last Friday. The President, Mr. Leslie Gamage, was in the chair.

We regret that in our illustration of oil circuit-breakers being made at the British Thomson-Houston Co.'s Willesden works (10 June issue) the rating was given as 750 MVA instead of 7,500 MVA.

Philips Electrical Ltd. have produced three new sales aids to support their advertising campaign for the Philishave dry shaver.

We hear that new plant is to be installed at the Glasgow works of British Luma Co-operative Electric Lamp Society. Production during the past 12 months is said to have reached 3,000,000 lamps for the first time.

Admission charges at the Motor Show are to be increased this year to "improve the amenities and general comfort of visitors." Attendance appears to have taxed the capacity of the exhibition premises to the utmost in the past.

Sayings OF THE WEEK

"I believe that as we gain more experience and as the economic difficulties of the industry are removed, it will be possible for Consultative Councils to be not watchdogs but partners." . . . ALD. I. J. HAYWARD at the B.E.P. Convention.

"Nuclear power stations would have to be in use for ten years before it would be possible to reduce electricity prices." . . . DR. N. THORNLEY, addressing a meeting of the N. of England Institute of Mining Electrical and Mechanical Engineers.

"Many business men would give anything to get out of entertaining. In many instances it was a burden and they did it out of duty, as part of their job." . . . SIR CHARLES COLSTON, speaking at an inquiry of the Royal Commission on Taxation of Profits and Income.

ELECTRIC SUPPLY NEWS

Croydon

The proposal of the B.E.A. to sink a borehole at Beddington, near the Croydon boundary, has been the subject of a public inquiry. Beddington and Wallington Council object to the proposals because they fear that they will result in some of the lakes and ponds in the district drying up because the flow of the Wandle would be considerably reduced. The Croydon Corporation, however, does not object, their attitude being that if the B.E.A. can get half a million gallons from another source it would relieve the demand on Croydon.

North of Scotland

The scheme to extend the Highland Grid of the North of Scotland Hydro-Electric Board, and to connect the five generating stations to be built under the Board's Loch Shin project in Sutherland, has been approved by the Secretary of State for Scotland. The purpose of the scheme is to enable supplies of electricity from the Board's hydro-electric stations to be sent to Caithness. Cost of the scheme is estimated at £1,702,000. Overhead transmission lines will run from the main power station of the Loch Shin scheme at Inveran to the power station at Ben Hee. Further lines will connect the other stations at Lairg and Cassley, and the Garvault power station will be connected with that at Ben Hee. The extension of the Highland Grid will be from the main generating station at Inveran to Mybster, where a transforming station will be erected.

A submarine cable has been laid to take electricity to the island of Eriskay from South Uist in the Outer Hebrides. The cable has just been laid between Saltavik, South Uist, and Rudha Ban on Eriskay. Electricity for the island will be provided from the North of Scotland Hydro-Electric Board's diesel generating station which is under construction at Daliburgh in South Uist. Survey work on the routes of the distribution lines on Eriskay has been completed, erection of the lines being the next stage. On South Uist, survey work has been completed and the construction of lines northwards from Daliburgh has begun. The contractors are James Scott and Company (Electrical Engineers) Ltd, and the consulting engineers are Messrs Merz and McLellan.

Shetland

The North of Scotland Hydro-Electric Board have decided to provide a supply of electricity to the island of Unst in the extreme north of Shetland. It will be some time yet before the distribution work can start but a survey of the route of the lines will begin this summer. The Board's standard tariff for areas supplied by diesel power stations, will apply, as in Lerwick.

Staythorpe

A sub-committee of Southwell Rural Council, is to investigate proposed extensions to Staythorpe power station and, if necessary, forward objections to the scheme to the Ministry of Fuel and Power. At the recent meeting of the Council, members said that while they appreciated the needs of industry for more electric power, they must safeguard the amenities of the Staythorpe district and landowners in the area. Present plans for the proposed extensions—known as Staythorpe "B", were for the installation of six 60 MW sets and associated boiler plant, along with three concrete cooling towers.

Lighting Schemes

Kelso. The T.C. is to spend nearly £2,500 on lighting the roadway from the south end of Kelso Bridge to Maxwellhough. The council is also to adopt the ripple control system.

Rutherglen. T.C. has approved a scheme for conversion of gas street lighting to electricity, estimated to cost £30,588.

QUESTIONS IN PARLIAMENT

Cable Exports to Soviet

WITH the resumption of Parliament last week, the President of the Board of Trade was again questioned on various aspects of trade with Communist countries. Mr G. H. Bing requested details concerning licenses granted or refused for the export of cables and cable products to China, Poland, Roumania and Russia, since 1 July last year. As far as Russia was concerned, Mr D. Heathcoat Amory stated in a written answer, that three applications, valued at £1,101, 163, had been received and all had been allowed. There had been no applications in respect of Roumania. Nine applications, valued at £830,936, were received to export to Poland, three (£754,566) were allowed and six £76,370) refused. As regards China 14 applications valued at £468,679, of a total of 17 valued at £479,389 were refused. The other three (£10,710) were allowed.

Strategic Controls

A statement on negotiations for major relaxations of stragetic controls on East-West trade may be expected soon. This may be inferred from a reply by Mr D. Heathcoat Amory at question time last week.

Trolleybus Costs

THE Whitsun recess did not quell the questions on trolleybuses. Mr Callaghan has asked what evidence there was of the comparative cost of operating diesel buses and trolleybuses. The Transport Minister said that operating costs of each type of vehicle varied so much according to particular circumstances that it was not possible to give any information which would be of value.

Exports to Russia and China

QUANTITATIVE control of the export of generators above 750 kW to Russia and exports to China were the subject of questions last week. Mr D. Heathcoat Amory rejected the suggestion that the export of generators was not a matter for the Paris meeting. He said quantitative limits were agreed in consultation with other countries. Similar replies were given in respect of other products being exported to China. Mr Amory said no changes had been made in the embargo list which resulted from the U.N. resolution of 1951, and any alterations would be a matter for the U.N.

Rates from Power Stations

IN AN adjournment debate last Thursday Mr E. H. C. Leather criticised the system whereby the supply industry contributed a lump sum of about £12m to the Exchequer, which in turn, allocated money to various districts in the country. He cited Portishead as one of the districts carrying the heavy burden of a power station. They had, said Mr Leather, to find amounts of money, enormous for them, to pay for such items as road maintenance and housing subsidies, for which they got little relief from the central pool.

Mr E. Thornton drew attention to a similar situation at Kearsley, where the power station represented two-thirds of the council's rateable value. Extensions were carried out and in anticipation of increased income the council embarked on new policies only to find that in 1948 they were deprived of increased revenue. Mr G. Nabarro mentioned Stourport in support of the previous two speakers.

Replying, Mr E. Marples pointed out that rates were never intended to equal services rendered to individuals. As regards Portishead, however, the U.D.C. knew what the rating would be for that station. He presumed they had calculated that the proposal would be beneficial, and had later found they were wrong. Mr Marples confirmed that discussions on similar matters had taken place with the Gas Council and they had nearly agreed on a new formula. If new methods of rating proved successful there, similar ways could be applied to other industries. Meanwhile all points mentioned would certainly be considered when the reconstruction of local government finances was examined as a whole.

COMPANY ACTIVITIES

THERE seems to be little doubt that the makers of radio and television sets and equipment for the industry are due for another business spurt in the autumn. New television stations are coming into operation and final preparations are being made to broadcast commercial programmes. Mr. E. E. Rosen, the chairman and managing director of Ultra Electric (Holdings) puts the situation in a nutshell in his annual statement to shareholders. "Your company," he said, "has taken steps to ensure that Ultra television receivers will be fully capable of reproducing the new transmissions when they begin." This is going to make the autumn radio and television show of more than usual interest.

Alternative programmes are bound to enhance the attractions of TV as a form of home entertainment. Profits of manufacturers in this section of the industry are already impressive. The E. K. Cole figures, just announced, show equity earnings of 95%. Dividend goes up from 25% to 27½% and requires £44,479 net. Profits after tax, rose from £134,200 to £181,300. Tax included 9 months of E.P.L., which from now on will not be paid. This should add another £70,000—£75,000 to the net profits bringing the dividend cover up to at least eight times, even if profits are only maintained at present levels. The shares rose sharply last week from 27s. 9d. to 31s. but still yield 4 2/5%.

Mr. H. C. Drayton is more successful in running his British Electric Traction interests than films. Close following the recent British Lion receivership brings out positively brilliant B.E.T. results with 1953/54 earnings up from 80% to over 90%. Dividend goes up from 35% to 50%. Out of the bountiful reserves of nearly £19 million (excluding those of associated companies) is to come a 200% scrip bonus. Looking ahead, Mr. Drayton forecasts a 20% dividend on the enlarged capital, equal to 60% on the present total.

Indicative of the hidden strength of this investment-cum-omnibus undertaking is a rise in the parent company's reserves by £5,722,000 to £6,666,500.—*From our City Correspondent.*

Aron Electricity Meter Ltd.

For the year ended 31 Mar. last, the profit amounts to £165,722 compared with £176,368 a year ago. The net profit is £52,765 (*£41,801*).

Atlas Electric and General Trust

There is to be a private issue of £1,250,000 4% Debenture stock in the immediate future, the chairman, Lord Remnant, told stockholders last week. Before the issue can be made it is necessary to amend the trust deed securing the existing 5% Debenture stock, and a meeting is called for 1 July to effect this.

British Thermostat Co. Ltd.

The past year was a record for this concern, Mr J. E. Sherlock, the chairman, reports, and following the 100% scrip bonus, shareholders are getting the equivalent of 55% dividend on the former capital. All sections of the business contributed to the excellent results, but further expansion in the manufacture of automatic control apparatus is contemplated. It is proposed to spend a considerable sum of money in re-equipping the factories with modern plant. A site at Eastergate, Sussex, has also been acquired for the establishment of an additional manufacturing unit. Treasury consent has been obtained for the scrip capitalisation issue of one new for every two ordinary shares held.

Year to Jan. 31	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	327,056	130,130	155	30	33/7	23/–
1951	366,430	130,397	162	30	36/–	29/–
1952	373,071	116,443	145	30	29/3	24/–
1953	347,326	150,097	178	35*	19/–	14/–
1954	530,119	198,499	111	27½	23/3	17/6

*Plus 100% capital bonus.

Broadcast Relay Service Ltd.

With a final dividend of 12% the Ordinary distribution for the year to 31 Mar. last is raised to 22% tax free (*18%*). In addition it is proposed to make a one-for ten rights issue to Ordinary stockholders. Group net profit for the period is £569,762 (*£475,564*).

E. K. Cole Ltd.

The total distribution in respect of the year ended 31 Mar. last is raised by 2½% to 27½% with a final dividend of 17½%. The group net profit, before taxation, is £588,832, compared with £534,802 a year ago. Taxation absorbs a further £407,500 (*£400,600*).

Greenwood and Batley Ltd.

With a final dividend of 12½%, the total distribution for the year ended 31 Mar. last is again 17½%. The net profit for the year amounts to £82,083, against £65,408 a year ago.

Keith Blackman Ltd.

After allowing all charges, including taxation, the net profit for the year ended 31 Mar. last is £276,866 compared with £413,025 for the previous year.

Ruston and Hornsby Ltd.

Although the group net profit for the year to 31 Mar. last, at £1,062,703 is some £63,819 lower than the previous year, the total dividend for the period is maintained at 12½% as before.

Scottish Cables Ltd.

The monthly average profit for the period just ended was below that of the previous year, as Mr William Fraser, the chairman, had earlier anticipated. The cause was the same as affected other cable manufacturers—a falling off in orders and unstable metal prices. But with a full order book, Mr Fraser is confident of the future. Additional land abounding the present works has been acquired, and extensions and new equipment are being proceeded with in connection with the rubber insulated and plastic insulated cable sections of the business. Certain other extensions are contemplated, arrangements are in hand to manufacture telephone cables, for which a new subsidiary, Scottish Telephone Cables and Equipment Ltd., has been formed. Following research and experimental work it has also been decided to produce aluminium sheathed cables, he adds.

Year to Mar. 31	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	273,901	115,355	80	30	23/9	21/8
1951	274,561	106,205	75	30	27/6	18/9
1952	327,198	122,603	75	32	11/9	9/–
1953	495,423	176,341	51	20†	13/3	11/1
1954*	391,239	149,399	44	27½	14/6	12/11

*Eleven months only. †Plus 100% capital bonus.

Telegraph Construction and Maintenance Co. Ltd.

The offer of 500,000 5% Cumulative Redeemable Preference £1 shares in the proportion of one for every four £1 Ordinary held, is to be made at par. A sum of 5s. per share is payable on acceptance and the balance on 12 July. The proceeds are to be used mainly to complete the plant and machinery renewal and expansion programme, but also to finance the development of overseas activities. The directors report that there is a falling off of orders in the power cable department, but it is believed that this is only temporary, although it may lead to some reduction in profits for 1954.

Ultra Electric (Holdings) Ltd.

The dividend for the year ended 31 Mar. last is raised by 2½% to 15%, and this on the enlarged capital. Group net profit for the year amounts to £219,301 compared with £175,767 for last year.

Venner Ltd.

For the year ended 31 Dec. last the dividend is maintained at 15%. The net profit for the period is £27,374, against £22,702 a year ago.

Allen West and Co. Ltd.

The comparatively small drop in trading profit from the previous year's record figure, was due to a slight reduction in sales. Mr M. W. H. Lancaster, the chairman, explained at the meeting last week. But the reduction did not appear to be progressive, he added. During the year, £71,000 was expended on new plant. The stock item has been reduced, but he doubts the ability to keep it down to the figure of £1,260,000.

Year to Jan. 31	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	734,414	283,537	53	10*	10/9	6/9
1951	706,835	254,664	50	12½	14/5	10/6
1952	951,980	296,870	58	15	12/–	8/3
1953	1,068,366	428,818	67	15	14/4	10/3
1954	995,484	338,600	53	17½	15/3	12/7

*Plus 60% capital bonus.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

25 June—Pembrokeshire. Installation at New Technical Inst., Neyland.—See 17 June issue.

28 June—Birmingham T.C. Rewiring at St. Martin's flats, Balsall Heath.—See 17 June issue.

28 June—Manchester T.C. Electrical installation in 42 flats and 292 houses under contracts 207 and 210, on Langley estate. Director of Housing, Town Hall. Deposit £1.1s.—Advertised in this issue.

28 June—Merton and Morden U.D.C. Fluorescent and sodium street lighting along A.24.—See 17 June issue.

28 June—Ramsbottom U.D.C. 140 W sodium street lighting on trunk road A.56.—See 10 June issue.

30 June—Beddington and Wallington (Sur) T.C. Sodium vapour lanterns with lamps, control gear, wiring, 25 ft columns, etc.—Advertised in 17 June issue.

30 June—Cardiganshire. Installation of electricity at (a) Bettws Bledrws V.P. school, and (b) Llangybi C.P. school. County Architect, County Hall, Aberayron.

30 June—Durham. Electrical installation in Houghton-le-Spring grammar school, and Blaydon West county school. Apply by above date to G. R. Clayton, County Architect, Court Lane, Durham.

30 June—Folkestone T.C. Electrical installation in 26 flats in North St. Names by above date to Architects, Willan, Stewart and Wate, 127 Sandgate Rd. Deposit £1.1s.

30 June—Kidsgrove U.D.C. Street lighting installation, Galleys Bank and Rookery estates.—See 17 June issue.

30 June—Manchester T.C. Passenger lift for Park Hall, Victoria Park.—See 17 June issue.

2 July—Aberdeenshire. Installation in police station and houses at Turriff.—See 17 June issue.

2 July—Manchester T.C. Electrical installation in 27 houses on various estates. Director of Housing, Town Hall. Deposit £1. 1s.—Advertised in this issue.

2 July—Stourbridge T.C. Installation of 242 units of class A street lighting with mercury vapour discharge lamps and concrete columns. G. N. Maynard, Borough Engineer and Surveyor, Council Hse.

3 July—Aberdare U.D.C. Street lighting equipment to replace existing equipment. —Advertised in 3 June issue.

3 July—Gloucester T.C. Electrical installation in St. Oswald's Rd Cattle Market. Applications by above date to City Architect, Suffolk Hse, Glos. Deposit £2. 2s. — Advertised in this issue.

3 July—Halifax T.C. Renewal of installation at Haugh Shaw secondary school. Borough Engineer, Crossley St. Deposit £2.

3 July—Mountain Ash (Glam) U.D.C. 9½ miles group A street lighting on main roads.—See 3 June issue.

5 July—Angus. Pole brackets with cable, etc., for street lighting at Tealing.—See 17 June issue.

5 July—Antrim R.D.C. Rotary distributor pump and ejector, etc., for sewage works at Killead.—See 17 June issue.

5 July—Co. Down. Electrical installation in block of 1 shop, 1 house and 5 flats at Comber. N. Ireland Housing Trust, 12 Hope St., Belfast. Deposit 10s.

5 July—Horncastle (Lincs) R.D.C. Installation of electricity in houses at West View, New York, No Man's Friend and Mill Lane, Wildmore. Surveyor, 6 Conging St.

5 July—Manchester T.C. Installation in residential nursery, Wythenshawe.—Advertised in 10 June issue.

5 July—Newton Abbot R.D.C. Maintenance of wirings, fittings, etc., in council houses in 12 months to 31 Mar. 1955. Engineer and Surveyor, Kingsteignton Rd.

5 and 19 July — Southend-on-Sea T.C. Electrical installation in (a) Bournemouth Park junior and infants' schools and (b) West Leigh primary school. Borough Architect, 30 Alexander St. Deposit £3. for each. Closing date 5 July in respect of (a) and 19 July in respect of (b).—Advertised in this issue.

5 July—West Riding. Rewiring at Morley Elmfield infants' school. County Architect, Bishopgarth, Westfield Rd, Wakefield.

5 July—Wombwell U.D.C. Wiring of 265 houses and bungalows on several council sites. C. Knowles, architect and surveyor, Town Hall.

6 July—Kirkcaldy T.C. Electrical installation in proposed clinic and creche at Templehall Neighbourhood Unit. Burgh Engineer, Town Hse.

7 July—Derby T.C. Electrical installation in 32 bungalows and 100 houses at Mackworth, and 104 houses in Harvey Rd. Borough Architect, Council Hse, Corporation St. Deposit £2. 2s.

7 July—Wandsworth B.C. Supply of 45 W and 60 W sodium lamps and jackets. Also, supply and erection of group B street lighting. Separate contracts. Borough Engineer, Municipal Bldgs, S.W.18.—Advertised in this issue.

8 July—Cardiff T.C. Supply of underground cables for trolleybus extension scheme. Transport General Manager, Central Offices, Wood St.—Advertised in this issue.

8 July—Northwich (Ches) R.D.C. Supply and installation of lanterns lamps, control gear and concrete standards in scheme of 140 W horizontal burning sodium vapour discharge lamps, for (a) Manchester Rd, Lostock Graham, and (b) Forest Rd, and High St, Tarporley. J. B. Birtwistle, Engineer and Surveyor, Whitehall, Hartford, Northwich.

10 July—Bournemouth T.C. Supply and erection of 45 sodium vapour main road lighting units. Borough Engineer, Town Hall. Deposit £1. 1s.

12 July—Aireborough U.D.C. Mercury discharge lighting along route A658.—Advertised in 17 June issue.

12 July—Brentford and Chiswick T.C. Supply, erection and wiring of 112 street lighting columns, mercury vapour lantern units, and control gear in Great West Rd. Borough Engineer, Town Hall, Chiswick, W.4. Deposit £2. 2s.

12 July—Camberwell B.C. Two pedestrian controlled street orderly electric trucks. Borough Engineer, Town Hall, S.E.5.

12 July—Maidstone T.C. Rewiring and relighting Corn Exchange. Borough Surveyor, Palace Ave.

12 July—Queensbury and Shelf U.D.C. Sodium street lighting equipment for about 62 points.—See 17 June issue.

14 July—Co. Antrim. Electrical installation at new intermediate school, Larne. A. N. Irens, consulting engineer, 58 Howard St, Belfast. Deposit £3.3s.

14 July—Newcastle-on-Tyne T.C. Electrical installation in 215 houses on Fawdon estate. City Architect, 18 Cloth Market.

15 July—Sutton and Cheam T.C. Erection only of concrete columns and supply and erection of GEC lanterns and all auxiliary equipment for 140 W sodium lighting scheme along about 3·15 miles of roads. N. H. Michell, Borough Engineer, Municipal Offices, High St, Sutton. Dep. £1. 1s.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 106 queries answered this week

Clock signs 10 to 12 ft in height to show the time by changing figures, i.e. 5.25, 5.26, 5.27, makers of? A.T.B.—Franco British Electrical Co., Ltd., 15 King St, S.W.1; Sign Construction Co., Ltd., 77 Grosvenor Rd, S.W.1.

"Primax" soldering guns and "Woodmaster" saw benches, suppliers of? B.C.L. — "Primax" — S. Kempner, 19 Ebury St, S.W.1, and "Woodmaster"—John Beighton and Sons, 40 Old Hall St, Middleton, Lancs.

Waterproof limit switches with roller lever operation, makers of? M.S.C.—Allen West and Co., Ltd., 32 Old Queen St, S.W.1.

"Turvex" tubular heaters, makers of? N.W.B.—We presume this refers to "Tuvec" made by the Heatovent Electric Ltd., Lomond St, Possilpark, Glasgow.

"Cutler Hammer Co." vacuum cleaner switches, address for? T.B.C.—N.S.F. Co., Ltd., Keighley, Yorks.

Instantaneous water heaters, makers of? F.W.H.—Campbell Eng. Co., Ltd., Sherman Rd, Bromley Kent; Price Water Heaters, 195 Bradford St, Birmingham 12; James Stott and Co. (Oldham), Ltd., Vernon Works, Oldham.

ANSWER WANTED

"Robust" watertight handlamps, makers of? E.M.S.

INDUSTRIAL MAINTENANCE

A special monthly section of the Electrical Times

Cable Trunking in Works Distribution

ITS POSSIBILITIES IN INDUSTRIAL INSTALLATIONS

By H. W. W. Fisher *

CABLE trunking, although not a recent innovation, is still regarded as a novelty by many Plant Engineers, especially when they are faced with the task of planning a distribution system for a new layout of electrically-driven machine tools involving the installation of a large number of circuit cables. This conservative view is normally fostered by their purchasing department, whose immediate concern is only with that of material costs, they being usually unaware of the substantial saving that can be achieved in labour and material costs by the utilisation of cable trunking as an alternative to multiple barrel conduit runs.

The saving that is possible is made more obvious by reference to the cable accommodation table on page 62. For example, it is required to feed a continuous row of nine motor-driven machine tools, these being spaced at regular intervals down the centre of a factory bay. The source of their supply is to be a conveniently-placed adjacent distribution board and their feed circuits will consist of a total of twenty-seven 3/·036 (660 V grade) v.r.i. cables. These cables may be installed either in five, 1 in. diameter, barrel conduits, incorporating in their run tee-type inspection boxes mounted directly above each motor and in each instance reducing to ¾ in. barrel conduit for the down drop to the isolator. Alternatively, they can be run in a single length of cable trunking 2 in. by 2 in. in cross section, once again using ¾ in. barrel conduit for the down drops. These would be fixed by bush and socket and taken from holes drilled in the trunking base. The labour costs required to install one foot of a single run of 1 in. barrel conduit does not differ appreciably from that required for installing one foot of a single run of 2 in. by 2 in. cable trunking, thus the utilisation of the latter method could show a saving on labour costs in the region of 80%.

**Mr Fisher is general manager of Channel Conduits Ltd.*

Economy and flexibility

Economy, however, is only one of the advantages that accrue in the adoption of this system. Equally advantageous, or even more so when large-scale planning is contemplated, is the high degree of flexibility and provision of reserve capacity that it affords in use.

The situation is such today that only forward-looking management will cope successfully with the fierce competition that is rapidly developing in both the home and overseas markets. It will either be adding fresh plant or changing production layouts to cater for the latest development. Outdated machines will be scrapped and replaced by later models and these, following the modern trend, will be of a higher rating in terms of h.p. Thus plant layout must be regarded as the most important branch of production engineering and it follows that a well-planned electrical installation is the foundation upon which production must rest.

The problem of installation design can be simplified by resolving it into terms of initial requirement, reserve capacity and flexibility potential. Whereas, all wiring systems will cater for the first factor, only cable trunking is capable of providing for all three simultaneously.

It is safe to say that very few wiring installations in the past have been planned with sufficient reserve capacity. While it may not be economical to plan for probable requirements 20 years hence when power consumption will be many times what it is today, nevertheless, an ample margin should be allowed. As food for thought and in order to provide a yard stick for approximate calculations for reserve capacity, the curve shown in Fig 3 indicates the upward trend of power consumption in industry generally.

Reserve Capacity

Reserve capacity must be catered for in many ways; in the size of the main switch-gear and main distribution boards; the number of spare ways on sub-distribution boards and so on. However, it is not in the province of this article to discuss these items. But it can be seen from the cable accommodation table how relatively simple it is to allow for quite a number of additional circuits to be added after the primary installation of

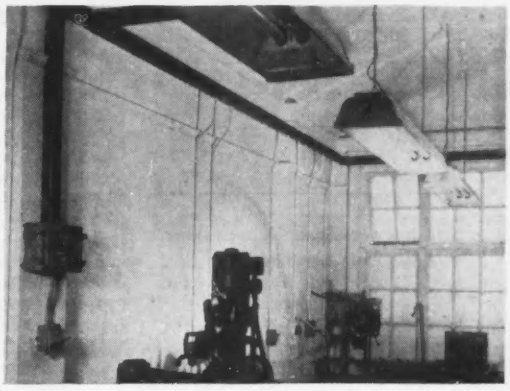


Fig. 1. This view of part of a workshop installation carried out in cable trunking provides a good example of its neatness in use

Comparison of Trunking and Conduit for Cable Accommodation

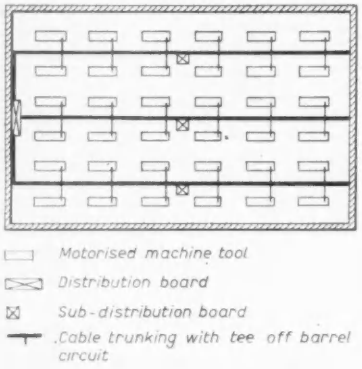
No. & dia. of wires	Grading of cables	Trunking—Cables accommodated						Ordinary round conduit cables accommodated					
		2 in. by 2 in.		3 in. by 2 in.		3 in. by 3 in.							
		Maximum	Recommended	Maximum	Recommended	Maximum	Recommended	$\frac{3}{8}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{4}$ in.	$1\frac{1}{2}$ in.	2 in.
3/·029	250 V	92	47	142	71	219	105	4	6	13	20	—	—
	660 V	60	32	92	48	147	72	—	4	9	—	—	—
3/·036	250 V	82	39	130	58	192	84	3	5	10	16	—	—
	660 V	60	28	92	43	138	63	—	3	6	—	—	—
7/·029	250 V	67	35	103	53	162	78	3	4	9	13	—	—
	660 V	49	24	79	36	117	54	—	2	5	9	—	—
7/·036	250 V	60	28	92	43	138	63	2	3	7	10	14	—
	660 V	41	20	62	30	90	45	—	—	4	8	—	—
7/·044	250 V	43	22	63	33	96	48	—	2	5	8	11	—
	660 V	36	17	50	26	75	36	—	—	4	7	9	—

cable trunking has been carried out and initial wiring installed. For example it could be calculated that a 2 in. by 2 in. cross section would be ample for the initial wiring of a factory bay, and yet, at very little extra cost, by increasing the size of cross section to 3 in. by 3 in., the capacity for cable accommodation has been increased by 100%.

Where there is the likelihood of complete re-arrangment of plant, cable trunking, because of its flexibility once again provides an easy solution. If installed properly in the first instance its reclamation value should be almost 100%. Additionally, all the barrel or flexible conduits forming the down drops from the trunking to the isolators should be capable of re-use as it is hardly likely that mounting heights will differ. Furthermore, as the cables forming the circuit wiring have been laid in as distinct from drawn in there is every possibility that these would prove suitable for re-use. Thus, once again expenditure may be maintained at the minimum.

Reference to Fig. 2 shows what could be regarded as an ideal installation for cable trunking. The main distribution board is centrally located, from it three runs of cable trunking are taken, these are run overhead attached to roof trusses, their longitudinal length positioned centrally between the gangways formed by the machines. From the board three circuits are taken in the cable

Fig. 2. An ideal machine layout for cable trunking installation



trunking, each circuit terminates at a sub-distribution board mounted directly to the central portion of its individual run of cable trunking. From the sub-distribution boards, multiple sub-circuits are fed through the cable trunking, each then individually branched off to its isolator by means of barrel conduit tapped from the trunking sides. Incidentally, it is a common sight to see sub-distribution boards mounted at the commencement of a run of cable trunking, whereas, if they had been mounted centrally, the circuits

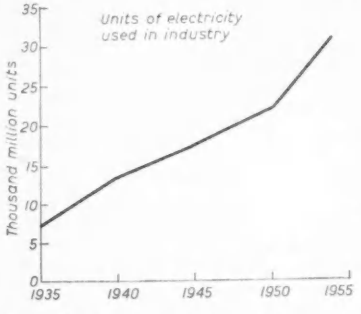


Fig. 3. The growth of the industrial consumption of electrical energy during the last 20 years

could have been branched in half thus allowing a proportionate reduction in the cross section of the trunking involved.

It would also have been possible for this particular installation to have had attached to the trunking the necessary lighting fittings required to illuminate the area. These could either have been mounted directly on to the underside of the trunking or alternatively suspended from it, in either case the cables comprising the lighting circuits enclosed in the trunking alongside those for power.

When full advantage is taken of cable trunking to run all the circuit wiring appertaining to normal factory services, care must be taken to segregate those circuits other than those for power, lighting and heating. The former usually consist of those required for telephone, loudspeaker, clock and signalling apparatus. This is done by means of an internally-fitted metal fillet fixed to form a continuous partition or barrier thus providing true physical separation. (See I.E.E. Regulations 315C.)

Mounting Fluorescent Lighting

In areas where a high level of illumination is required, it is now common practice to adapt cable trunking to form a continuous lighting batten. Fluorescent tubes are mounted directly on to the underside of the trunking by means of spring clips, the interval between the lamps depending upon the illumination value required. The control gear is usually mounted inside the trunking on the inner surface of the detachable cover forming the reflector.

Where, however, it is intended to include circuit cables other than those required for lighting or the number of cables accommodated is such that their bunching brings them into unavoidable contact with, or directly above, the control unit, then the latter should be mounted on to the outside of the trunking. The reason for this is because the running temperature of the control gear is usually in excess of the ambient air temperature considered suitable for v.r.i. cables. When the situation is such that the batten form of lighting cannot take full advantage of ceiling reflection, then it is suggested that trough-type reflectors are fitted. Many firms supply these items separately.

When motorised tools are spaced at close intervals the most economical method of wiring is that already described. Occasionally, however, one is faced with the problem of feeding a series of machines relatively fewer in number but spaced over a greater distance. At first, it would appear that a busbar system is the answer, but on calculation it is found that the total load involved would not warrant the necessary capital expenditure. In this instance it is worthwhile considering the adoption of cable trunking to form what is commonly known as the cable tap system, which will provide all the facilities of a busbar system but at a much lower cost.

For this particular scheme it is recommended that the size of the cable trunking should not be smaller than a 4 in. by 3 in. cross section. The trunking is installed for the required length and a

continuous three-phase or three-phase and neutral supply is provided by single v.r.i. cables laid inside the trunking—the cable ratings suitable for the total load/phase. Where outlet points are required a suitable hole is drilled, and connection to a metal clad fused cutout, of appropriate rating, is usually made by a bush and socket arrangement. The branch circuit is made by tapping v.r.i. tails off the main cables via insulated connector blocks, these being normally described as shrouded cable taps. The tails themselves lead to the tops of the cut-out fuses. Where vibration exists the cable taps should be filled with a sealing compound thus counteracting any screw loosening effects.

Vibration Effects

Cable trunking, although providing continuous mechanical protection for its contents, suffers, because of its shape, from the defect of reacting in a similar manner to a sounding box in that it will amplify all vibrations to which it is subjected. Thus the vibration inherent in most factory structures will, over a long period, be capable of loosening most screw-type fixings. Efficiency of the system's earth continuity is essential, and although every reputable manufacturer of cable trunking incorporates some form of earthing link for use between lengths of trunking and accessories, it is still recommended that a further earth continuity conductor is run inside the trunking.

The most vulnerable portion of cable trunking to be affected by vibration is its cover, and although an effective safeguard is provided by the spring cap type of cover, this innovation is confined to the smaller sizes, the largest at present on the market being 4 in. by 4 in. in cross section. Where screws are used to fix the cover to the box these should always be provided with spring washers.

Final Appearance

Neatness and ease of access are too often forgotten when drawing up plans for a distribution system, but this omission is understandable, when immediate requirements overshadow those of the future. It is, however, not unusual to walk into a factory and see an untidy mess of pipes encircling the walls, festooning ceiling trusses and creating a visual effect not unlike that of a dead garden creeper adorning a portion of trellis work. In all probability half the conduit runs are no longer in use, and it is only because of his long association with the plant that the maintenance electrician knows which of them is in current use.

For a total contrast study the photograph (Fig. 1) showing part of a workshop installation carried out in cable trunking. This provides a good example of the neatness that can be achieved in its use. Further study will make apparent the ease of access that is available, and because of this, circuit cables can be inspected for faults throughout their whole length or replaced in the shortest possible time.

Where cable trunking passes through walls, partitions, floors or ceilings, suitable fire resisting barriers should be provided, and these should have a fire resisting value equal to the surrounding structures. (See I.E.E. Regulations 407.) Because of the various cable sizes that can be contained in a trunking the most suitable method advocated is to bunch the cables at the point of penetration and bind with asbestos tape.

The one serious abuse to which cable trunking is open is that of over-crowding. Unless strict instructions are laid down in order to limit the number of cables to be eventually accommodated, circuits will be progressively added until the duct is filled to capacity. The result of this abuse will cause voltage drops not originally allowed for and subsequent current limitations, and a breakdown of the cable insulation will ultimately follow with all its attendant evils.

This chain of events is easier to understand when we consider that any cable carrying current will generate heat, the amount being given by the formula I^2R where I is the current carried and R its resistance. The ultimate cable temperature is dependent upon the rate of dissipation of this heat and if the thermal characteristics of its external surroundings are such that it cannot be dissipated, then its ultimate temperature will be in excess of the safe continuous working temperature which should be in the region of 90° F.

The generated heat would in the normal manner have been dissipated largely by self-induced air currents circulating through the cables and around the inner surfaces of the cable trunking, but as extra cables are added their bulk will replace an equal volume of air and at the same time provide a further brake to retard free circulation. When dealing with the question of the maximum number of cables that may be safely accommodated, a sensible and simple ruling that can be adopted is that the total number of cables to be finally accommodated in any cross section of cable trunking should never exceed 50% of its maximum bulk capacity. This will allow ample facilities for heat dissipation.

Some Points about the Electricity Regulations

Part 5

by H. W. SWANN, O.B.E., D.F.H., M.I.E.E.

AT the end of the previous article in this series, which discusses the Factories Act 1937 and the Electricity (Factories Act) Special Regulations 1908 and 1944 I was discussing the adequacy of circuit protective devices, particularly fuses. Regulation 1 affects these with its requirement that "all apparatus and conductors, shall be . . . so constructed, installed, protected, worked and maintained as to prevent danger, so far as is reasonably practicable." My final concern was the use of h.r.c. fuses as back-up protection for circuit-breakers. This form of protection does perhaps defer the evil day when switchgear replacement must be faced, and it establishes a good principle—that of separating short circuit and overload protection—but unless such arrangements are planned as a whole before erection then improvisation may be far from satisfactory.

In the early thirties switch explosions began to add up—35 were officially reported in one year—some attended by loss of life. Manufacturers were at a disadvantage as organised performance testing was possible only on a small scale and designers tried to follow up cases where their switches had cleared operational short circuits successfully so that the fault energy involved could be calculated as a check on their own estimates of rupture capacity. The explosive failures were not all due to circuit-breakers being under rated for the job, in fact the classic case of the Bradford switchgear fire started from a breakdown of an insulator. In another case the side spring finger of a fixed switch contact was jammed inwards by the upward thrust of the moving member on the switch area. This was not known and the switch (6·6 kV) remained on load until it exploded with such violence that a young fitter's mate at work in the switch room, about nine feet distant, was fatally injured, his clothes being burnt or blown away. There have been damaging explosions in switch cable and boxes and again some of the failures of 33 kV circuit-breakers in past years have occurred at fault values estimated to be not more than one-third of the assigned maximum performance, which the designers had every reason to think had been attained. In another recent case a circuit-breaker exploded whilst in the open position.

It cannot be said in cases such as these that the terms of the Regulations as to adequacy have been contravened, and in fact no prosecutions on that score have been conducted.

It is perhaps relevant to give an indication of the violence which attends these failures on heavy electrical high

voltage systems. In addition to the hot oil and gas flame emissions, the blast of the explosion is by itself a very serious factor. I once investigated a fatal accident which occurred when a substation man was walking past the stator of a 6·6 kV 25 cycle motor at the moment when there was a short circuit in the end turns of the windings. He was not marked or burnt to any extent but was instantly killed and I have never had a similar case. The experts at the inquest were not very successful in explaining the facts to the coroner, and I had some difficulty in persuading him not to attach undue importance to the steel spectacles worn by the deceased. He was convinced they had attracted the electricity. After the failure of a round tank 33 kV oil circuit-breaker it was found that a number of 1⅛ in. high tensile strength steel bolts securing the tank to the top plate had sheared or elongated. The end doors of the substation involved were blown away and the walls bulged to an extent which nearly dropped the overhead span crane.

Even at 400 V short circuits can be violent when near a heavy source of power. Four people at the back of an open type switchboard in premises almost adjoining a large power station were derobed when one of them, in some way, got the metal guard of a hand lamp across the busbars, and in another case I personally saw a man's hand stripped to the bone by the explosion of a 500 V d.c. open fuse wire contained in an earthenware box he was holding. It is perhaps worth remarking that the bones were not blackened, and I have seen something similar when examining a cat which I extricated from three horizontal 3,000 V busbars, one of which had cut a deep section in its chest without apparent burning or discoloration. It was at about the time that this run of switchgear failures was occurring that two (I think) of the makers of heavy high voltage switchgear erected performance testing plant capable of imposing short circuits of up to a million kVA on circuit-breakers to verify the ratings assigned by design. I was once afforded an opportunity of seeing a big switch tested to destruction and remember it as most impressive and instructive.

Switchgear Testing Facilities

Soon after these new plants got to work, I had approaches from the manufacturers of the smaller classes of gear for substations, factories and general industrial use. They found themselves at some disadvantage as they could not face the cost of expensive testing plant and although their big friends were willing to test and report, the cost of this procedure was considered high and some of the smaller manufacturers did not altogether share my opinion as to the high integrity of their big brothers. They looked on them as competitors in the lower switchgear ranges and were not anxious to afford them opportunities of finding out all the weak points and true rupturing capacity of their products.

It was suggested that as the Regulations required switchgear to be adequate ("sufficient in size and power"), my Department should take steps to assist manufacturers by establishing a testing station. As at the time I thought we were in for a good deal more switch trouble attended by accident I put the matter up to Sir Frank Smith, who was then running the D.S.I.R. and N.P.L. He supported the idea and later on a meeting was arranged at the Treasury at which I was just a little surprised to find that funds would be forthcoming for a short circuit testing station of initial capacity to suit the smaller manufacturers. It was to be erected and operated by the N.P.L. but the project was not pursued because it became unnecessary on the inception of A.S.T.A., an organisation which took over existing testing stations, built others, and offered testing facilities for all. It was arranged that certificates of test should be furnished and, if so desired by a customer, an N.P.L. representative would be appointed to observe the tests and endorse the certificates.

This scheme satisfied everybody, so far as I know, and it has certainly achieved the objects in mind. The knowledge and data acquired by testing has been invaluable, and in conjunction with system fault energy computation machines or analysers, has enabled manufacturers to meet known conditions with equipment certified as capable of fulfilling them.

Performance Ratings

The upward trend in switch explosions has definitely been arrested, but as knowledge about performance ratings increased so did the anxiety of a good many plant engineers who found that their estimates of the capacity of their switchgear had to be revised in the light of "derating." A good many of them gave me their views, more than frankly, when I ventured to make enquiries about the position. One of them—a north country man—said, as nearly as I can remember, "If I go and find out about this and it comes out wrong, you can go for me and so can my Board, but if I don't find out you can't." This seemed to me about right, but as his point was rather fundamental in factory law I had to refer to Section 123 which gives an inspector power to make enquiries and, by implication, to get an answer.

Taken overall the attempt to keep switchgear ratings in line with supply development is a large scale and costly job and it was, and still is, recognised as a long term matter. One big manufacturing concern sought an interlocutory injunction from the High Court restraining the Supply authority from causing danger on their premises. Various expedients have been adopted in different places such as grouping small switches under the protection of an adequate master switch, set for instantaneous response, the automatic features of the little ones being either time delayed, and relegated to overload, or removed altogether. This is not altogether satisfactory and if trouble occurred it might constitute proof of danger for purposes of the Regulation.

I tried to ease the position by asking some of the supply engineers whether they could stabilise conditions over a reasonable period, say to maximum energy values of 100 MVA at the intakes of the larger high voltage consumers and I reached agreement here and there and might perhaps have done more had it not been for the war. The need of making some attempt to peg fault energy values was referred to by the B.E.A. in a recent report in connection with the "Supergrid" and I have often tried to get the point considered at high voltage distribution level in the interests of industrial consumers, although I fully realise the great difficulty of meeting the increasing demand of consumers on the one hand and restricting the fault energy on the other. After all it is the consumer who creates the demand, and, as I have said in some of my annual reports, the question of fault energy, as between Supply and Consumer, is essentially one for co-operative effort.

Adequacy of switchgear is a point which has to be considered, with a good many others, by a plant engineer who is asked to run a factory generating station in parallel with the public supply. A handbook on the subject has recently been published by the B.E.A.

The word "worked" stands by itself in Regulation (1) and when the context, which embraces other solitary words, is added, the requirement emerges essentially as—All apparatus shall be so worked as to prevent danger so far as you can.

Operational Working

The field of operational working, beginning at the power station and ending say at the last small tumbler switch on consumers' premises, is pretty wide and gives plenty of room for making mistakes. I remember making a very serious one myself when I isolated a section of 10 kV switchgear for cleaning, all but the back end of the bus coupler. An accident would have been inevitable if the foreman had not known how to do the job better than I did. Looking still further back to the time when I was a substation attendant, I recall that I was seldom quite sure about the exact moment when it was appropriate to close the synchronising switch on an incoming rotary converter for traction supply. There were only two carbon filament lamps to go by and "good phases" were few and far between owing to the fluctuations of the load. If I went in a little late, the rotary flashed over a foot or so from the back of my unprotected neck, and it is possible that a factory inspector, inclined towards a strained interpretation of the regulation, might say that I did not so work the synchronising switch as to prevent danger from very hot globules of copper. This aspect of the matter did not, however, add to my anxieties because at that time I fear I knew nothing of any regulations and was more concerned about the danger of intercepting the baleful glances of my superior officer.

E.C.C. Ref. S.205 Direct-on-line Starter

DATA SHEET 6

THE E.C.C. ref. S.205 direct-on starter, as illustrated, is specifically designed for use on non-reversing s.c. motors up to 7½ h.p. and is stocked in the sizes shown in the table.

Weight complete 7¼ lb. Dimensions: Height 7·8 in. Width 6·5 in. Projection 7 in.

Spare Parts.—Moving contacts 40S—50857; Fixed contacts 39S—50857; Retaining clips 84—50857; Start switch complete 6 and 16—50855. Stop and reset complete 7 and 17—50855.

Use oil as supplied, or S.A.E. 20 or S.A.E. 30 for longer time lag.

H.P.	Amperes 3 p.h.	No.	Colour Code
½	·8–1·29	½ 50850	
¾	1·3–1·69	¾ ,,	Brown*
1	1·7–2·99	1 ,,	Blue
2	3·0–4·79	2 ,,	Green
3	4·8–6·49	3 ,,	Mauve
5	6·5–9·9	5 ,,	Red
7½	10·0–13·5	7 ,,	Yellow

**Overload calibration only.*

The colour code refers to standard starters and the colour scheme is followed throughout for rating plates, calibration plates and outer cardboard containers.

Description

This is a particularly robust starter housed in a die-cast aluminium case with a smooth exterior, furnished with a rubber grommet making it suds and dust proof. Conduit entry is either top, bottom, or each side, the conduit being secured with a shroud plate covering a standard conduit nut. Two blanking covers are supplied. The mechanism is mounted on two pillars which enable the starter to be drawn forward for servicing. A moulded arc shield is provided.

The same starter is also available in: (1) A larger case with isolator switch. (2) As an open type a.c. contactor for incorporating in multi-circuit panels or for special switching arrangements with interlocks if necessary, and including automatic star-delta starting and reversing circuits.

The standard unit has 3 pairs of make and break contacts for a 3 ph. supply, with an additional pair for the contactor coil circuit, but the starter can, if necessary, be fitted with special contact assemblies giving up to 36 different switching arrangements for special purposes.

The start button can be omitted for remote control operation and the stop and reset button replaced by a reset only. For inching, with remote control, a ventilated case is provided with only side cable entries.

Construction

The starter consists of 4 main parts: (*a*) The back moulding, carrying 4 terminals, 3 for the incoming mains. (*b*) The coil and magnet assembly with moving contacts. (*c*) The top moulding carrying 4 fixed contacts. (*d*) The overload unit and the 3 outlet terminals.

The back and top mouldings carry two steel strips which support a ⅜ in. tube on either side. The tubes, sliding on fixed studs in the case, enable the mechanism to be drawn forward for inspection after slackening the two fixing nuts. These two mouldings carry the fixed silver contacts of ample size, with single screw fixing.

The magnet system, of conventional design, slides between the back and top moulding and carries the spring loaded moving contacts, which are retained by a clip sprung over a tongue passing through the contact. The magnet coil is held in position by two spring L clips (see No. 8 in Fig. 2) and the moving part of the magnet is fully floating and retained by a split pin (10).

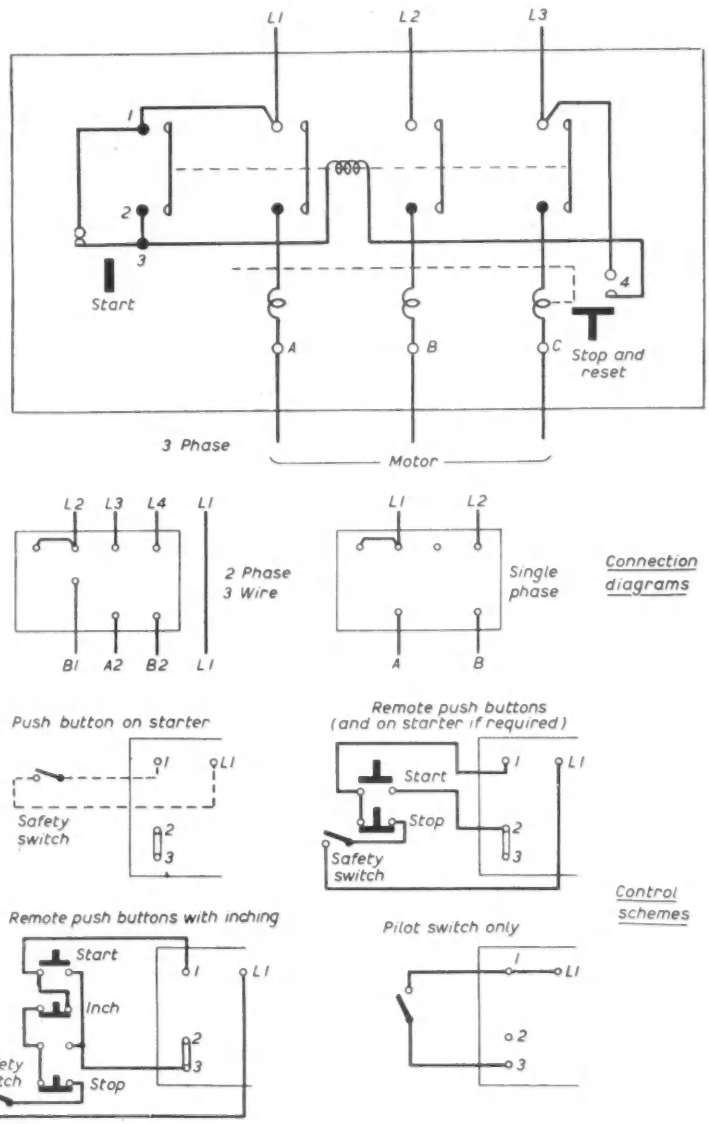


Fig. 1. Circuit diagram and connections for the starter

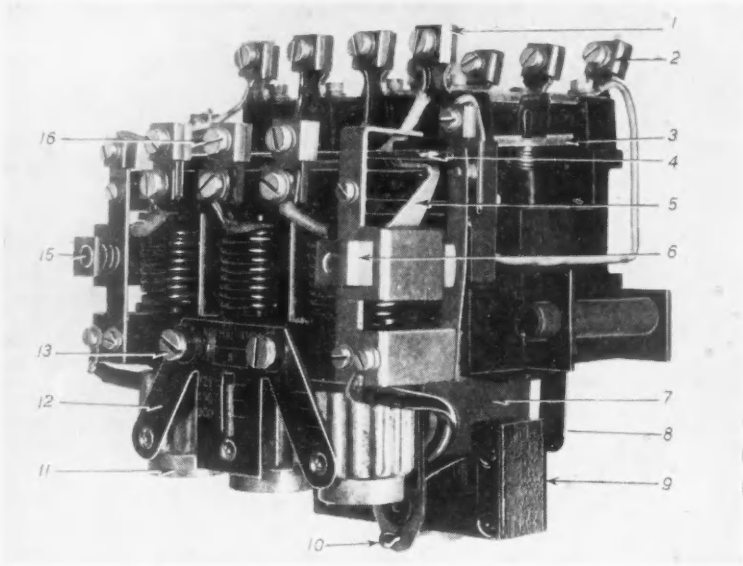


Fig. 2. Internal view. 1 and 2—fixed contacts; 3—moving contact; 4—trip bar; 5—catch; 6—stop and reset; 7—coil; 8—coil retaining spring; 9—magnet (moving part); 10—retaining split pin; 11—dashpot; 12—calibration plate; 13—fixing screw; 14—overload coil; 15—"start"; 16—outlet terminals

When reassembling carefully align the copper tubes with the iron channel circuit as they pass through the overload coils, using a suitable piece of rod or a screwdriver as an alignment tool.

To Remove Complete Overload Unit. (1) Undo coil lead at bottom of (6) and (15). (2) Undo 2 retaining screws (13). (3) Disconnect p.v.c. leads going to top of unit (6) and (15). (4) Disconnect 3 overload coil ends connected to fixed contacts (16).

Beneath the unit will be found two loose rubber washers through which pass the two retaining screws (13). Be careful to replace them when reassembling.

The stop and start units (6) and (15) are fixed to the overload moulding. Each of these comprises 2 parts, the top part fixed with 2 screws and the lower with 1 screw.

The Overload Unit

This is another moulding carrying three overload coils and three dashpots (11). The ribbed sides of the dashpots are spring loaded by the calibration plate (12) clearly marked with the ampere rating and 125 % 150 % and 200 % overload marks.

The start and stop switches are mounted on the left and right of the overload moulding respectively. They are of pressed construction with large silver contacts. That on the right (the stop and reset) is shown in detail in Fig. 4. The initial pressure on this button closes the coil circuit and resets the trip bar if tripping has occurred. Additional pressure, by still further bending the contact leaf, causes the contacts to open and de-energise the starter.

Maintenance

As in most modern starters maintenance consists in keeping the mechanism clean and replacing any worn or damaged parts. Care should be taken, however, when changing contacts, that the loose retaining clips on the moving contacts are not lost or dropped into the mechanism. Similarly when changing the overload coils, the small labels A, B and C must likewise be checked and care taken to avoid any damage to the split copper tubes when replacing them (see below). The left hand pair of fixed contacts for the coil circuit also has loose number tabs which must be replaced for identity purposes.

The dashpots and oil must be kept clean and the oil level maintained to within $\frac{1}{8}$ in. of the top of the pot without the plunger.

The face of the magnets must be kept free from rust or the action will be noisy. If it is still noisy after cleaning, the shading rings in the magnet faces should be examined. Take care that the arc shield does not wedge any of the cables.

To Change Coil. (1) Remove pillar retaining nuts and draw starter forward. (2) Remove split pin (10), withdraw magnet, remove 2 spring L clips (8).

To Change Contacts. The fixed contacts (1) and (2) are readily accessible and when removed permit the moving contacts to be reached. The retaining clips are sprung off with a small screwdriver. Don't lose them.

To Change Overload Coils. (1) Remove calibration plate (2 screws) (13) and dashpots with pistons.

2. Remove start and stop contacts, 2 screws each (15 and 6).

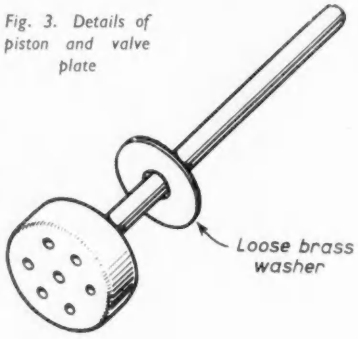
3. Remove 3 moulded striker plungers which engage on trip bar.

4. Push out the 3 split copper tubes passing through the 3 coils.

5. Spring out trip bar and undo overload coil connections (on 3 fixed contacts and on 3 outlet contacts) (1 and 16).

6. Lift out overload coils, middle coil first.

Fig. 3. Details of piston and valve plate



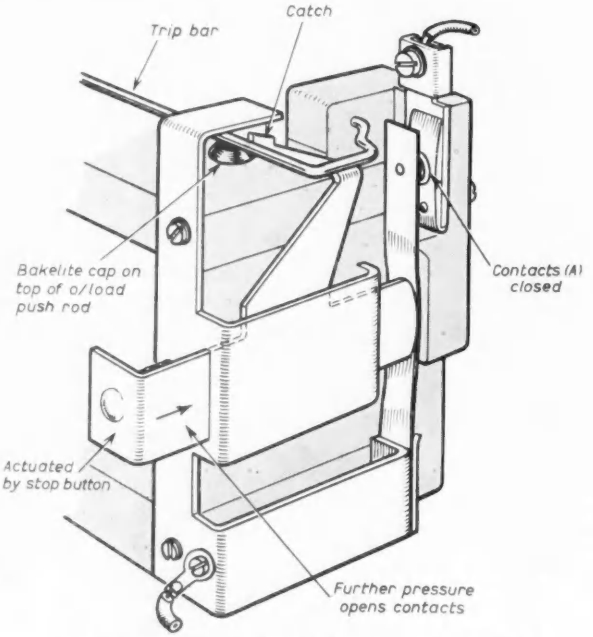


Fig. 4. Details of stop and restart mechanism (see Fig. 2)

Commissioning and Testing Plant

By a Steelworks Electrical Engineer

Part I

THE amount of commissioning and testing work which is carried out by works electrical staffs is determined by the type of organisation and its technical resources. In many factories it is the practice to call on the manufacturers to install, erect and set to work all items of new equipment which lie outside the range of routine installations. Further, advantage is often taken of the facilities which the manufacturers offer in the way of skilled supervision and specialised equipment to investigate and rectify breakdowns of the gear when in service. At the other extreme some organisations are large enough to employ staff capable of carrying out all erection and commissioning work, and of locating and dealing with all types of fault including major re-winds.

Whatever the position at any particular works may be, some testing is bound to be carried out without outside assistance. The purpose of this and subsequent articles is to discuss some of the methods and principles which the author has found to be of practical value, in the hope that they may prove of assistance to works engineers. It is not suggested that these will represent the only means or the best means of doing the job; their chief merit lies in the fact that they have been proved in practice.

Safety

The two basic principles which should underlie any testing procedure are firstly that the equipment should be put into service without damage, and secondly that the safety of personnel should not be endangered during the tests. Both points are obvious enough, but the latter deserves to be stressed because it is whilst tests are in progress than there is the greatest temptation to save time by taking risks, for example in handling live connections, which may have the most serious consequences.

It is therefore most desirable, if the gear is of any complexity, that a programme of testing be drawn up before the work begins, in order that it may be carried out in a logical order and with the minimum of danger. An example may be quoted where a transformer was being put into service for the first time. The insulation resistances of the h.v. and l.v. windings and cablework was taken during the course of an afternoon, and on the following morning the control gear was checked before switching-in. Unfortunately a fault had developed in the l.v. cablework during the night, and when the transformer was energised the fault destroyed some of the cabling with consequent delay and expense. The probability of such an occurrence is extremely remote, but the fact that it can happen and has happened is sufficient justification for insisting that insulation tests of circuits should be made immediately before making alive.

It is good practice when testing, to work on the principle that every circuit and piece of equipment should be assumed to be defective unless it has been proved to be satisfactory, and that no gear should be energised until it has been tested. The fact that a circuit has been wired in a manufacturer's works and checked before despatch does not guarantee that no error has been made and the correctness of such equipment should not be automatically assumed. Clearly, if this be accepted, similar reasoning applies much more forcibly to work carried out on site.

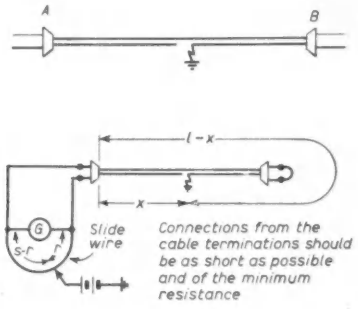
Insulation Testing

The portable insulation testers in common use consist of a magneto generator which applies a voltage to the circuit under test, and by means of a dynamometer instrument measures the ratio of voltage to current. The current which flows is the sum of those due to leakage through or across the insulation, to the charging of the capacitance of the circuit and to the dielectric stress which is set up in the insulating medium.

The first of these effects is that which determines the "insulation resistance" and for l.v. circuits or circuits of small capacitance the needle of the insulation tester will quickly move to an indication of the leakage resistance. With h.v. circuits or gear of appreciable capacitance however, the other two effects will at first mask the leakage current, and the insulation resistance will apparently rise as the charging current falls with continued application of the test voltage. In the worst cases this effect may be important for several minutes, and may actually persist for much longer periods. In order to obtain results of any value it is therefore essential that the test be applied for at least a minute, and if comparative readings are being taken, as in a dry-out, the test should be for the same period of time on each occasion. Since there is a limit to the capacity of the human arm a motor-driven test set is of great assistance if tests of this type are regularly carried out. A certain amount of information can be obtained from the behaviour of the test set; thus an initial low reading followed by a slow build up to a steady value will usually indicate a healthy circuit free from excessive leakage. On the type of circuit discussed above a steady reading which is obtained immediately after the test is applied and from which the needle shows no tendency to rise will generally point to dampness or dirt at some part of the gear.

Cable Testing

The two essentials of cable test are that they should establish that the insulation between cores is satisfactory and that the cores are correctly connected at either end. This may be done in one operation if earths are applied at one end, and the test set connected to the other. The R, Y and B cores would be earthed and the insulation of the neutral core taken, and subsequently the connections would be altered to leave one core clear from earth at a time. This will give the combined insulation between cores and core to earth, and at the same time check that the jointer has



Figs. 1(a) above and 1(b). In the lower figure, when the galvanometer reads zero, r/s = x/l, where r, s, x and l are the resistances of the various sections

not "crossed colours" at any part of the cable run. It is always desirable to check the core to core insulation, although in certain cases this may be difficult e.g. when the cable is terminated directly on to a machine or transformer. The best solution is either to remove internal links on the equipment to separate the three phases, or if this is not possible, to test the cable with the cores split before the termination proper is completed. In one instance a 3 core 3·3 kV cable had been repaired by making a straight joint, and whilst the core to earth insulation was about 3,000 megohms in all cases, two of the cores were found to have less than half a megohm insulation resistance between them.

When two or more cables are run in parallel, a check of the core to core insulation of the completed circuit is essential, since a wrong connection will short-circuit two of the cores. Mistakes of this kind can occur on quite short and straightforward cable runs, e.g. the connections from the slip-rings of an induction motor to the rotor resistance, with disastrous results.

Some idea of the condition of a paper insulated cable can be gained from the state of the paper; if moisture is present it will show up as small globules when the paper is heated in a blowlamp flame, and further the paper loses its natural resilience when damp. If the cable sheath has been punctured the belt papers will initially

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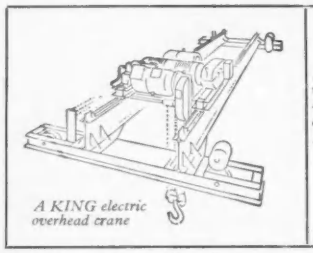

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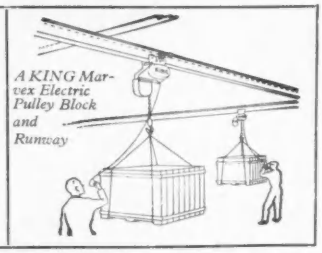

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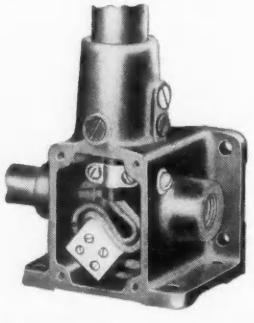

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absorb moisture and the cable will have to be cut back until the paper is definitely dry; if a "pot-end" is punctured the moisture will tend to travel down the copper and the core papers will suffer.

The location of faults on underground feeders implies that records should be conscientiously kept of the routes followed and the positions of joint boxes. The first job is to determine without doubt the nature of the fault, and to do this it is necessary to test the cable from both ends. The reason for this will be apparent from

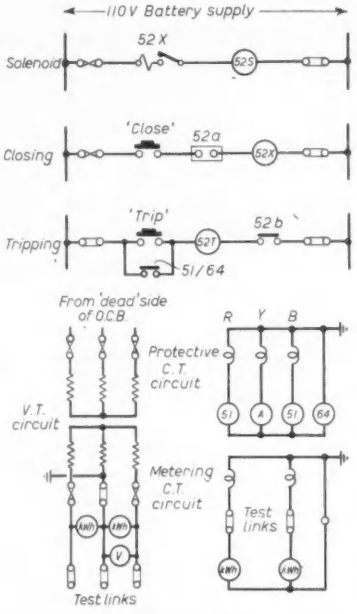


Fig. 2. A typical schematic diagram of a switchgear control scheme. Detail numbers are; 52—main circuit-breaker; 52S—main c.b. closing solenoid; 52X main c.b. closing contactor; 52T—main c.b. trip coil; 52a—main c.b. auxiliary switch (normally closed); 52b—main c.b. auxiliary switch (normally open); 51—phase fault relay element I.T.D.M.; 64—earth fault relay element, I.T.D.M. kWh—kilowatt-hour meter; A—ammeter; V—voltmeter

Fig. 1a. If the cable were tested from A only it would appear to be clear of earth; if tests are made from both ends the true state of the cores will be found by taking insulation and continuity tests.

The standard Murray loop test, shown in Fig. 1b, is a variation of the Wheatstone bridge and was originally devised for testing telegraph circuits. Remarkably accurate results can be obtained by this method if simple precautions are taken; the short-circuit between cores at the remote end of the cable should be of the lowest possible resistance, as should the connections from the slide wire to the cable.

An essential item is a device for locating the cable under test from a group of cables, and various commercial products are available which utilise headphones and a search coil to pick up the radiation from an injection test set connected to one end of the cable.

Insulation and continuity testing, the loop test and the identification of the circuit will all take up a certain amount of time but it is bad policy to try to rush this part of the job since a mistake may involve hours of fruitless excavation work.

Switchgear Testing

The commissioning of switchgear is usually incidental to the commissioning of the circuits being controlled. It is desirable to treat the switch as a separate unit, and if possible to carry out a complete set of tests including energising at full voltage, before setting to work the associated circuit.

The first point to be checked is the mechanical operation of the switch. For air-break gear this will usually be a straightforward procedure, using the manual operating handle. H.V. switches of more than 150 MVA rupturing capacity are not usually arranged for manual operation, and it will be necessary to use the hand-operating gear provided specifically for testing purposes. The clearances of the main and arcing contacts should be checked, together with the operation of the mechanism. It should be noted that in the case of oil-break switches the oil serves as a buffer to take the impact of the moving contacts when the switch trips, besides performing the major function of acting as an insulating mechanism; in consequence serious damage may result if the switch is tripped with the tank lowered or empty of oil. If operation is to be checked under these conditions the free travel when tripped should be limited to the minimum by using the manual testing handle.

Electrical Circuits

For purposes of illustration Fig. 2 shows a typical simplified schematic diagram applicable to an outgoing feeder unit. With the switch isolated from the busbars and the auxiliary supplies and all fuses removed, the insulation resistance should be taken of every wire and piece of equipment in the control circuit. The earth connections in the v.t. and c.t. secondary circuits will have to be removed whilst the insulation is being checked, and must be restored immediately afterwards.

The auxiliary supply may now be brought in to the live side of the fuses and the trip circuit made alive using fuses initially instead of the normal links. The switch should be closed manually and tripped by operating the push button and by manually closing the contacts of the overcurrent and earth fault relays. A check should be made to ensure that the interlocking between the circuit-breaker auxiliary switch and the trip circuit is in order. The closing circuit should next be energised to check the operation of the closing contactor and when this has been proved the solenoid fuses may be inserted and the mechanical performance of the switch observed. A check should be made of the labelling of the fuses as incorrect identification may, in emergency, waste time.

The operation of the I.T.D.M. relay should now be checked either by primary or secondary injection, dependent on the equipment available. For each element of the relay observations should be made of the minimum operating current, the operating time at twice, ten times and, if possible, twenty times the rated relay current, the operation of the flag indicator when the relay contacts close, and the run-back time of the relay. The plug selector on the relay will usually have to be set to the lowest tapping in order to make twenty times the rated current a figure within the capacity of the test set.

The last check before energising the unit should be that of the insulation resistance

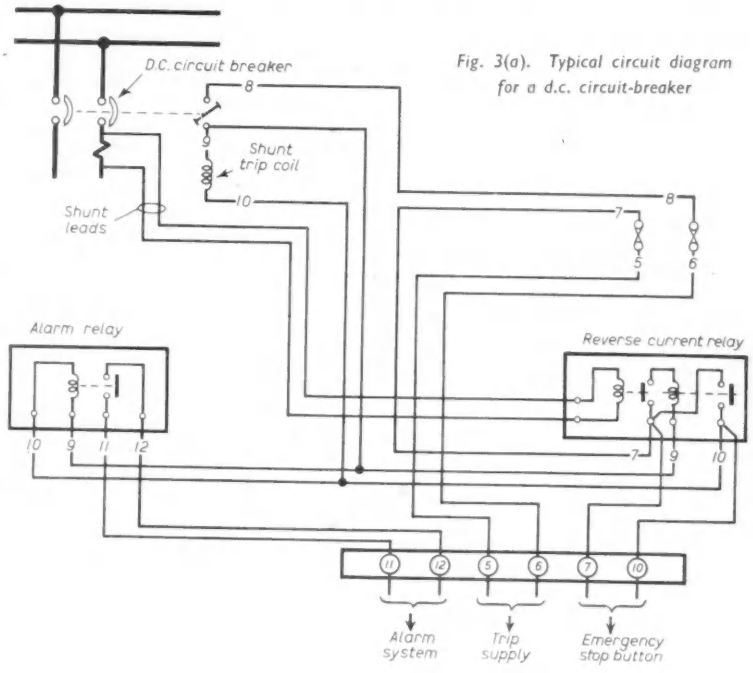


Fig. 3(a). Typical circuit diagram for a d.c. circuit-breaker

of the main circuit; with the switch closed phase to phase and phase to earth readings should be taken. If the exposed insulation of the switch is clean this test will really check only that there is no metallic connection between the various parts, because the general level of insulation, even if defective, will probably be high enough to make the test set read infinity or nearly infinity; this applies particularly to h.v. oil circuit-breakers.

The switch is now ready to be energised, and, assuming that the outgoing side has been satisfactorily proved, may be racked in with the protective relay set initially at its most sensitive position; this will ensure that the switch will clear quickly in the event of trouble. With relays of the I.T.D.M. type the time multiplier should

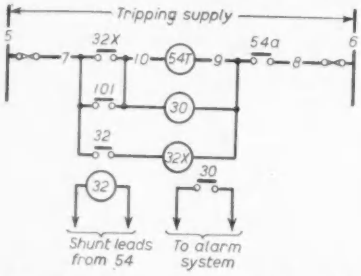


Fig. 3(b). Schematic diagram of Fig. 3(a). References are; 54—d.c. circuit-breaker; 54a—d.c., c.b., aux. switch (makes when breaker closes); 54T—d.c., c.b. trip coil; 32—reverse current relay; 32X—reverse current relay aux. contactor; 30—alarm relay; 101—emergency stop button

not be set much below 0·1 because the clearance between the contacts becomes very small and it is possible that the switch will be tripped due to mechanical vibration operating the relay.

After the switch has been closed the secondary voltages of the v.t. should be checked and as soon as load current is available the current in each part of the protective c.t. secondary circuit should be read, preferably by using a split plug in the relay plug bridge. When full load is being carried the spill current in the earth fault element should not exceed 5 mA. The rotation of the kWh meter should be checked, and if its accuracy is in doubt a check meter should be put in the circuit using the test block provided for this purpose.

Switchgear Breakdowns

Failures of switchgear in service are far from common and generally are confined to defects in the mechanism or the auxiliary switches, particularly on units which are frequently operated. In large works it is common practice to use a standard h.v. switch as a starter for large motors, and in these cases special attention should be given to the two items mentioned during maintenance periods.

Metalclad switchgear which has been left in the racked-out position for long periods will sometimes prove troublesome due to condensation in the spouts of the fixed portion, and similarly difficulties may be experienced with air break gear through deposits of dust lowering the insulation resistance of the main circuit. Neither of these effects are very likely in a properly laid-out installation, but if a switch has been out of service for long it is as well to clean down carefully before energising the unit.

When auxiliary supplies are derived from a battery it is possible for extensive damage to be caused by a short-circuit in the wiring of the trip circuits, which are normally connected to the bus-wiring by links rather than by fuses. Cases have occurred when the trip-circuit wiring of a switch and the associated bus-wiring throughout the switchboard have been destroyed due to a fault which passed sufficient current to overheat the wiring, but not enough to blow the main battery fuses. Similar effects may be the result of earths on the wiring coinciding with an earth on the battery. The integrity of the auxiliary circuits is therefore a point to be checked.

The designs of auxiliary plugs and sockets to take feeds to the moving portions of withdrawable switchgear are generally satisfactory, but trouble is sometimes met in this connection and if c.t. circuits are carried through to the moving portion an open circuit in the auxiliary plug sockets may result in burning and damage to c.ts. Some engineers consider this danger to be so real that they will not allow c.ts. or c.t. operated equipment to be mounted on the moving portions.

So far as the main circuit of the switch is concerned the maintenance instructions issued by the manufacturers will cover adequately the points to be watched, and little further need be said on this subject. It is the standard practice in supply work for an oil switch to be inspected as soon as possible after it has cleared a fault; this is a principle which should apply also to works systems.

Control Gear

The equipment installed for the control and protection of electrical plant may vary in complexity from the simple under-voltage and overcurrent releases used in the starters of small induction motors to the complicated schemes of automatic control which are required by drives such as printing machinery and rolling mills. The principles of commissioning are, however, the same, and may be summarised as follows

(1) Every circuit should be checked before full voltage is applied through the normal control gear.
(2) The alarm, control and protective circuits should be tested before the main circuit is energised.

It may not always be possible to keep to the above. For example a d.c. motor may be protected by directly connected overload coils the operating current of which may be too high for them to be checked by artificial means; in such cases the check can only be made with the circuit energised at full voltage, and the risk of a mal-operation must be faced. There is little to be said against taking such risks since back-up protection in the form of h.r.c fuses can be provided.

Diagrams of Connections

Commissioning testing and fault finding work is impossible unless a diagram of connections is available, and it is most desirable that this be in the form of a schematic, as opposed to a wiring diagram. The latter shows the physical arrangement of the gear and the positions of the wires interconnecting the various items of equipment but for testing purposes the schematic diagram is much more convenient, provided that the physical positions of the individual inlays, switches etc. are known.

Figs. 3*a* and 3*b* provide a simple illustration of this point. A d.c. circuit-breaker is shown, arranged for hand closing with a shunt trip coil which may be energised either from a reverse current relay actuated from a shunt in the main circuit, or from an emergency push button. An alarm relay is provided which closes its contacts if the trip coil is energised. Even in this elementary case the schematic diagram is much easier to follow. For more complicated schemes a schematic is essential before the principles of operation can be understood.

Some manufacturers, particularly those concerned with small equipments, supply only a wiring diagram with their products and as a result valuable time is wasted by exasperated engineers and electricians in " sorting out " the circuit. If no schematic diagram is available it is often worth while spending a few extra minutes in the office

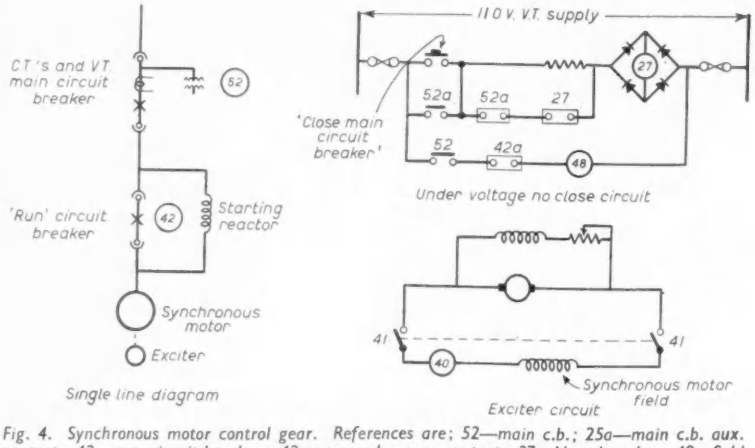


Fig. 4. Synchronous motor control gear. References are; 52—main c.b.; 52a—main c.b. aux. contact; 42—run circuit-breaker; 42a—run c.b. aux. contact; 27—No-volt relay; 40—field failure relay; 48—timing relay, and 41—field switch

preparing one, rather than arrive on site and to trace the circuit from a diagram.

The commissioning of individual pieces of equipment such as generators, motors and transformers will be dealt with later; this section refers specifically to schemes of control which involve the operation of machines under conditions of continuously varying loads and speeds.

The control arrangements will involve some or all of the following types of circuit:

(*a*) Circuits fed directly or indirectly from the terminals of the machine being controlled which function only during the starting or stopping periods. Over voltage devices, undervoltage, no close relays and schemes of electrical interlocking are of this type.

(*b*) Circuits fed directly or indirectly from the terminals of the machine being controlled which function during the operation of the machine; typical circuits are those which incorporate "feed-back" arrangements, with electronic or electromagnetic amplifiers.

(*c*) Circuits fed from an auxiliary source of supply at constant voltage. These will almost always include closing, tripping and alarm devices, auxiliary contactors in the control scheme and sometimes reference voltage circuits for feed-back schemes. These circuits are generally straightforward and largely correspond to the standard schemes of control for switchgear.

Fig. 4 shows part of the control circuit for a synchronous motor which illustrates the application of the first type described above. The scheme is conventional and the closing, tripping and alarm circuits are not shown for this reason; the only point to be noted is that the timing relay 48 is included to ensure that the starting reactor is only in circuit for a limited period of time. At the end of this period the relay closes its contacts and trips the main circuit-breaker unless the "run" switch 42 has been closed.

Checking the Relays

Apart from the usual procedure to be followed when commissioning the switch and motor, it is necessary to check the operation of relays 27 and 40 before the gear is energised at full voltage. The most convenient method of doing this is by bringing in a 110 V supply to the "dead" side of the v.t. fuses; it is important that the v.t. itself should not be energised from the 110 V supply, as this will produce the full voltage on the primary winding and may in consequence make the whole h.v. circuit alive at the rated voltage. With supply on to the circuit it is possible to check the operation of the U.V.N.C. relay and the timing relay, together with their associated interlocking contacts. The 110 V supply should be suitably fused and should preferably include a rheostat or variable transformer so that the "drop-off" voltage of relay 27 can be checked.

The field failure relay is essentially a current-operated, rather than a voltage-operated device; this arrangement guards against loss of field due either to failure of the exciter or to open circuit in the rotor winding. If the field current of the motor is small relay 40 may be checked by passing a current through it from an external source of d.c. supply; however a large machine or one designed for power factor correction may have an excitation circuit rated in hundreds of amps and it will prove difficult to check the relay by artificial injections. This represents an example of the problem referred to earlier; the solution is to operate the relay manually to ensure that when de-energised it does, in fact, trip the main circuit-breaker. When the machine itself is commissioned and the field switch 41 is closed, relay 40 can be checked to see that it is functioning satisfactorily.

Feed-back Control Schemes

Fig. 5 illustrates the elements of a closed loop control scheme; the switches LS1, LS2 and LS3 are actuated by cams on a shaft driven by the motor being controlled, and their operation results in a variation of voltage output of the bucking exciter. The current in the control field F2 of the main exciter is determined by the difference in voltages of the bucking exciter and main

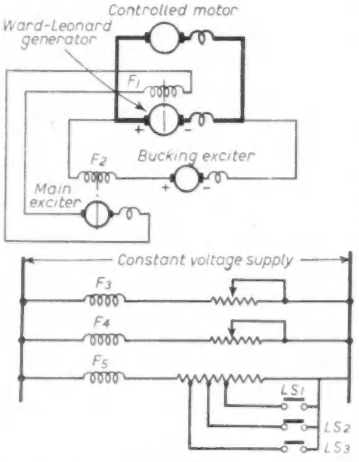


Fig. 5. Control scheme for variable speed drive. References are; F_1—generator field; F_2—main exciter control field; F_3—main exciter reference field; F_4—motor field; F_5—bucking exciter control field; LS_1, LS_2, LS_3—cam operated limit switches. The driving motors are not shown

generator, and when these two are equal the system will be quiescent; the output of the main generator is thus forced to follow the output of the bucking exciter, and thus the speed of the motor is determined by the operation of the limit switches.

A "switch-on-and-try-it" system of commissioning for a circuit of this type may produce catastrophic results because if one of the field windings is connected in the wrong sense its effect may be cumulative instead of differential and the machine voltages may build up to dangerous values with the probability of flash-over on the commutators. It is essential that each stage of the scheme be checked separately before the overall operation is attempted. The first stage is to commission the driving motors for the Ward-Leonard generator and the exciters, and to carry out the usual insulation tests on the d.c. circuit.

The bucking exciter armature and the main exciter control field should be isolated from each other and from the main generator terminals, and the individual machines commissioned separately as described below. Whilst preliminary tests are in progress it is desirable, though not essential, to work with a low value of excitation on fields F3 and F5, and if the constant voltage supply is derived from an m.g set at, say, 250 V d.c. it would be preferable to bring in a 110 V: supply from a battery instead, to be used whilst commissioning. This will reduce the general level of voltages and minimise the damage which might be caused by a machine defect. Whilst the exciters shown in the illustration are simple separately excited machines, they may in practice be of the amplidyne or similar type, with high amplification factors, and in such cases the initial application of reduced excitation should be regarded as essential.

Checking the Set

When the excitation circuits have been suitably supplied the bucking exciter may be run up and its polarity and open circuit characteristic checked by manually operating LS1, LS2 and LS3 to vary the excitation of field F5. The next stage is to run up the main exciter and check its output by varying the field F3; F3 should then be isolated and the reference field F2 temporarily connected to the constant voltage supply or its alternative, through a suitable rheostat. The output of the exciter should be checked under the control of F2, and in particular it should be ensured that F2 is in opposition to F3 when the current flows in F2 in the direction which would result from the generator voltage being higher than the bucking exciter voltage.

The controlled motor should now be isolated from the Ward-Leonard generator and the latter run up to speed, together with the main exciter; the polarity and open circuit characteristic of the W.-L. generator may be checked by varying the current in F3. If the generator polarity is incorrect it may be rectified either by reversing the connections to F1 or by reversing the connections to both F2 and F5. The main Ward-Leonard loop may now be restored and with full excitation on F4 the motor should be run up by gradually building up the reference field F3.

The individual parts of the circuit have now been checked, and the scheme as a whole may be put into commission by reconnecting the bucking exciter armature and the field F2 to the generator terminals and running the whole installation. Some further adjustments will almost certainly be required because until the various excitations are correctly set the generator output will either reach the value determined by the limit switches too slowly, or will overshoot the desired value and then come back to it. In the elementary scheme shown this could be corrected either by adjusting the rheostat in series with F3, or by altering the positions of the resistance taps corresponding to LS1, LS2 and LS3. In practice an anti-hunting circuit of some type is often provided which may be adjusted to produce the same result.

The control scheme described is based on an actual installation and is typical.

FORESEEING EVENTUALITIES

by W. H. A.

IT is a common failing of executives that they are not prepared to devolve authority. Maintenance chiefs are no exception and assistants and juniors are expected to refer to them in many unnecessary situations. This is a dangerous and regrettable attitude, often causing considerable overwork to the chief, and creating discomfort and indecision in his department.

In the writer's opinion, routine work should be reduced to a minimum in an executive's life. He is hired for his brain and powers of direction, and if every emergency must wait for his considered opinion he is failing to create the essential breathing spaces during which he can think.

Now, if he could be sure that, in his absence, the correct procedure would be adopted when an upset does take place, he would be a happier man. He would also be more successful, for the efficiency of his department is a measure of his personal worth to the business.

Would it be possible to foresee certain eventualities and lay down a method of procedure to be followed by the assistant or senior foreman? Surely every chief does this instinctively in any case. Any man in charge of a plant must often pause and say, "What would I do if, say, the compressor in No. 2 bay gave trouble? Of course, I would make a superficial examination and, if I thought too much time was going to be involved, I would get that flexible line strung across the beams and take a supply from the end bay compressor. This would mean that the air supply to the blowers on the XY machine would have to be shut off, but that wouldn't matter even for a whole day."

Now, wouldn't it be wise to have this information available so that an assistant would know that he is on the right lines with his instructions. To go further, couldn't he also have his list of eventualities so that his men are not waiting for "Father" when an indication of what is required would set them in motion.

Let's take a practical example. A factory has two boilers, automatically oil fired. The feed pump system is also automatic. Neither boiler is capable of taking the entire factory load during the winter months. There is a semi-skilled attendant who also does odd jobs which are brought to him in the boiler house. He is fully employed, but his prime responsibility is the care and operation of the boilers. Now, the occurrence most likely to affect him is that one of the oil-firing units will shut down. Remember it is a "bag of tricks" to him. On the wall are a small number of Eventuality Charts. Probably he knows the relevant one by heart as cutting out of a unit must occur at intervals. (See Chart I.)

The important point is that he sends for the appropriate tradesman. Further, he conserves his steam, cutting off the central heating which will not be missed for some time. He minimises the effect of the occurrence on the plant. He has done the right thing.

The tradesman arrives and makes his examination, keeping his "weather eye" on the pressure gauge. In any case the attendant will cut off further plant at 60 lb/sq in. and still more at 40. He will also inform Mr Blue. The entire situation is under as reasonable a control as possible.

Obviously, the charts must be made to suit each individual factory and the idea can be extended by a close co-operation between production and maintenance.

There are further aids which should be provided. The electrician, for example, is kneeling in front of the unit with the control box open. Obviously this is only one of many electrical panels with which he is expected to deal. He can't remember each one vividly. No doubt there is a diagram where he can see at a glance every switch in the starter operating coil circuit.

Alternately, this can take the form of written directions. For instance, let us consider the case of three conveyors. Goods can go from the first to the second, and then to the third. Alternatively, the third can be cut off from the system and "one" and "two" operate together. It must be impossible for "one" to operate if "two" is stopped, and when "three" is in operation, if it should stop, both "one" and "two" must be cut off.

Now a diagram showing this could make matters merely a little better to a tradesman probably harried by the Stores Department anxious to get the system under way. On the other hand if a simple statement of the control circuits is available it can be of great help. The undernoted example is not taken from practice as it is safer for each one to be done on the job. (See Chart II.)

Now the writer has always deplored the tendency to indulge in over-elaborate paper-work in the Maintenance Department, but the charts and aids suggested are written or drawn only once, and are of permanent benefit.

Chart No. II—Control Circuits of Conveyor System

Conveyor No. 1	Control circuit external to starter: Stop button at entrance—high package trip—inspector's switch—sequence switch in starter of No. 2 conveyor
Conveyor No. 2	Control circuit external to starter: Orange coloured switch at junction of conveyors 1 and 2—stop buttons east end—west end—sequence switch in starter of No. 3 conveyor
Conveyor No. 3	Control circuit external to starter: Alarm bell panel, contacts 4 and 5—stop buttons east end—west end—"pile up" safety switch

Chart No. I—If Oil-firing Equipment on one Boiler Shuts Down During Normal Operation

Water Level	Low (below orange mark). Shut main steam stop-valve. Ease pump. 'Phone fitter. Adopt **A**		Normal	If all three are normal 'phone electrician. If pressure drops below 75 lb/sq in. adopt **A**
Steam Pressure	High (95 to 100 lb/sq in.) Wait for normal start. If pressure drops below 75 lb/sq in. 'phone electrician and then adopt **A**		Normal	
Oil Temperature	Low (below mark). 'Phone electrician if pressure drops below 75 lb/sq in. adopt **A**	High (scale almost completely red). 'Phone electrician. Wait for temperature to fall. If pressure drops below 75 lb/sq in. adopt **A**	Normal	

If pressure drops below 60 lb/sq in. adopt **B**. If pressure drops below 40 lb/sq in. adopt **C**. **A** Shut down central heating. **B** Shut down calorifier No. 1 and Washing Plant. Inform Mr Blue, Assistant Engineer, at this stage. **C** Shut down process to West Block. One boiler will maintain the remainder of the plant at a reasonable pressure.

19 July—Durham T.C. Rewiring of town hall. City Engineer, Town Hall. Deposit £2. 2s.—Advertised in this issue.

19 July — King's Lynn T.C. Vertical spindle borehole type pump with ancillary equipment. — See 17 June issue.

20 July—Epping U.D.C. Installation of electricitv in 20 houses.—Advertised in 10 June issue.

26 July—Leeds. Electrical services in twin operating theatre unit at County Hospital, York.—See June 17 issue.

28 July—Ilford T.C. Plant and equipment, for Roden St sewage pumping station.—Advertised in 17 June issue.

30 July—Taunton T.C. Sewage and storm water pumping plant, etc.—See 10 June issue.

20 Sept. — N. of Scotland H.E. Board. Supply, erection, etc., of two 150,000 lb/hr steam generating units and all ancillary apparatus; steam receive and steam exhaust, feed water, blow down and drain piping; modifications to coal and ash handling plant etc, at Carolina Port power station, Dundee. P. Philip, area manager, 7 Dindhope Crescent Rd, Dundee. Deposit £5. 5s. — Advertised in this issue.

No date stated—Ayrshire. Equipment and installation work for trunk road lighting at Kilwinning.—See 17 June issue.

No date stated—Co. Tyrone. Electrical installation in 7 farm buildings at Sixmilecross. T. J. Pollock, Cavanreagh, Sixmilecross, Omagh.

No date stated—Fort William T.C. Electrical installation in four blocks (16 houses) at Claggan site. J. A. W. Grant, chart. architects, 36 Melville St, Edinburgh.

No date stated—Inverness. Lamps in year from 1 July for Inverness Hospitals Board. See 17 June issue.

No date stated—Midlothian. Electrical installation in primary school at Easthouses, Dalkeith. County Architect, 32 Palmerston Place, Edinburgh.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

14 July—South Africa. Tenders (C.7933) invited for supply of single unit 6·6 kV oil circuit-breaker switch panel, and 200 kVA 6·6 kV/400V indoor transformer. Stores Dept., S. African Railways, P.O. Box 8617, Johannesburg. B.o.T. (Ref.: ESB 14664/54).*

14 July—South Africa. Supply of total of 6,000 ft of cable to various specifications for Stores Dept., S. African Railways. Tender No. C,7889. B.o.T. (Ref.: ESB 14666/54).*

15 July—India. Madras Dept. of Electricity requires manufacture, testing, erection etc. of indoor and outdoor lighting installation at Kancheepuram sub station. Specif. No. E.224. Superintending Engineer, Technical, (Electrical), 157 Mount Rd, Madras. B.o.T. (Ref.: ESB 14832/54).*

20 July—Netherlands. Call for tenders will be made for 25 kW generator sets with switchboards, other electrical equipment, cables and telephones; electrically-driven flameproof pumps; valves and flanges; ventilation equipment; piping; fire fighting equipment; control instruments for pumping station; water treatment plant; and electrically-driven air compressors; all in construction of jet fuel depot at Best. Specifications should be ready 1 July and bids should be submitted within three weeks. Contact Directeur Gebouwen, Werken and Terreinen, Ministarie van Oorlog, 40, Bagynestraat, Den Haag.

20 July—New Zealand. Supply of three voltage and phase protective relays, which will operate from 3-phase supply of 400 V between lines and 230 V to neutral. Frequency is 50 c/s. Tender No. P.S.S. 179. Director-General, Stores Div., Post and Telegraph Dept., Windsor Building, Wellington. B.o.T. (Ref.: ESB 14455/54).*

20 July—Uruguay. Supply of 400 metres of 3 paired armoured telephone cable for Administracion Municipal de Transportes Colectivos de Montevideo. Specif. No. 477. B.o.T. (Ref.: ESB 14847/54).*

23 July—Uruguay. Tenders (No. 4029/54) invited for supply of 2,000 metres of 220 V armoured cables and accessories. Usinas Electricas y los Telefonos del Estado. B.o.T. (Ref. ESB 14340/54)*

2 Aug.—Pakistan. Supply, construction, erection, etc., of a turbo-alternator set with steam raising plant, four boilers and boiler room equipment, switchgear, cables, etc., and spares, for Saidpur power station, Eastern Bengal Railway. Tender No. ENG.X/28029/53. Dept of Supply and Development Govt. of Pakistan, Karachi.

1 Sept.—India. Tenders invited for electric locomotives, coaching stock, components, boilers, etc. for 1955-56 rolling stock programme of Govt. of India's Railway Board. List divided into two parts for which closing dates are 1 Sept and 1 Oct. Details, quoting ref. S.661/54/C.B./RLY, from Director General, India Stores Dept., 32-44 Edgware Rd, London, W.2.

30 Sept.—Australia. Manufacture, supply, erection etc. of steam generating plant for Port Augusta B power station: four or five units each of 360,000lb./hr. capacity. Documents from Preece, Cardew and Rider, consulting engineers, 8, Queen Anne's Gate, Westminster.

No date stated—Italy. Installation of electrical power station (250 kW) with electrical power lines and transformer station for supplying pumping station, in fourth Slice Fuel Storage project at Cagliari. Closing dates not yet known but firms are advised to communicate immediately with Ministerio della Difesa-Marina, Direzione Generale del Genio Militaire per la Marina, Lungotevere della Navi, Roma.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 22 June

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	239½	−½	252
„ (3 months)	237½	−½	—
LEAD, refined pig, min. 99·97% purity (cash)	96½	−¾	91½
„ (3 months)	94½	+¼	87½
TIN, refined, min. 99·75% purity (settlement)	727½	+3½	686½
„ (3 months)	726	+3	686½
ALUMINIUM, ingots 99-99·5%	156	—	161
ZINC, virgin, min. 98% purity (cash)	79	−½	72½
„ (3 months)	79½	—	72½
RUBBER No 1, RSS. spot (per lb.)	19⅝d.	+1/16d.	20⅛d.
„ c.i.f. basis, ports. August (per lb.)	19 1/16d.	+1/16d.	19⅛d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52	+1	51½
Mild Steel Tape (0·014 in.)	40½	+½	40

Contracts Placed

Warrington R.D.C. Supply and erection of 143 lanterns, poles, etc., along A.57 and A574, Metropolitan-Vickers Electrical Co., Ltd., £11,337.

Bournemouth T.C. Supply, etc. of 362 lighting units for main road lighting scheme, General Electric Co., Ltd., £14,400.

Metropolitan Water Board. Cable laying for 22 kV supply at Ashford Common works pumping station, Southern Electricity Board, £2,750; supply, installation of cables, conduit, lamp columns, etc., for oil storage depot and road lighting at same, George E. Taylor and Co. (London) Ltd., £2,647.

Ripon T.C. Street lighting phase 1 of Lead Lane site, General Electric Co., Ltd., £803; scheme carried out by N.E. Electricity Board, £603.

Billericay U.D.C. Street lighting schemes at Laindon and Wickford, Eastern Electricity Board, £1,677.

Crosby T.C. Supply and erection of 45 140 W sodium lamps, steel columns, etc., in Moor Lane, Revo Electric Co., Ltd., £4,123.

Leeds. Installation in new West Leeds Occupation Centre, B.C.S. Electrics Ltd., £1,030.

TRADE NOTES

Representative. Thermodare (Gt. Britain) have appointed as their representative in the Eastern Counties, Mr D. W. Lee, 56 Hobleythick Lane, Westcliff-on-Sea.

Holidays. The head office and works of Higgs Motors Ltd., will be closed from 23 July until 9 August.

The offices and works of the Sturdy Electric Co., Ltd. will be closed from 31 July until 16 August.

The Clifton Road, Luton, works of the Jackson Electric Store Co., Ltd. will be closed from 17 July until 2 August.

The works of the Plessey Co., Ltd. will be closed from 16 July to 3 August.

Changes of Address. As from 24 June, the London office of Permali Ltd, is at Windsor Hse, 46 Victoria St, S.W.1. The telephone No. remains ABBey 6494.

The B.T.H. Lamp and Lighting Depot at Edinburgh will be at new premises at 12, Thistle St, Edinburgh 2, from Monday, 28 June. The telephone number remains CENtral 6922.

On and after 24 June, the address of the Junior Institution of Engineers will be 14 Rochester Row, Westminster, S.W.1 and the telephone number VICtoria 0786.

BUSINESS PROSPECTS

Home

Aberdeen. Scottish Dept. of Health has approved erection of 144 houses at Kincorth.

Airdrie (Lanark). Revised plans approved for primary school and secondary school in South Bigger Rd, and for adaptations at St. Margaret's school.

Arbroath. Plans approved by Dean of Guild Court for erection of 50 houses on Hayshead site for Scottish Special Housing Assoc.

Ashby (Leic.) R.D.C. New housing estate comprising 98 houses to be built at Donisthorpe.

Axbridge (Som.) R.D.C. Plans prepared for 56 houses at Kewstoke.

Ayr. Globe and Simpson Ltd., of 184 West St., Sheffield, are to build new factory in Peebles St.

Barnes T.C. Erection of 72 flats and 12 garages at Priests Bridge, Upper Richmond Rd. Borough Engineer and Surveyor, Municipal Offices, Sheen Lane, S.W.14.

Belfast. Plans being considered for extensions to Royal Victoria Hospital and Royal Maternity Hospital. Also layout plans been approved for £59,000 physiotherapy, diversional therapy school, etc., at Orthopaedic Hospital.

Bishop Auckland U.D.C. Approval given to erection of between 200 and 300 houses at Witton Park.

Blackpool. New factory to be built in Back Collins Ave. for Sunnytops (Distributors) Ltd., of 217 Newton Drive.

Blyth T.C. It is planned to build 252 houses in Gordon Rd, 41 off Laverock Hall Rd, 24 in Newsham Rd, and 24 in Delaval Ter. Also, plans to be prepared for 50 houses at Seeton Sluice.

Bristol. W. G. Cox and Sons Ltd., toy manufacturers are to erect new factory at Kingswood. Also, erection of 30 houses at Headley Park. Cunningham and Giband, surveyors, All Saints Hse, Exchange, Bristol.

Colne Valley U.D.C. It is proposed to build 30 houses at Netherby and 20 at Corn Mill Field.

Consett (Dur.) U.D.C. Construction of shops etc at Cutlers Hall, Blackhill. Eltrinham and Lowes, architects, Derwent St, Blackhill, Consett.

Deptford T.C. Erection of two 5-storey blocks of 20 flats each, a 4-storey block of 16 flats and 3-storey block of 24 flats in Clyde St and Shardeloes Rd. E. Field, town clerk, Town Hall, New Cross Rd, S.E.14.

Durham. Improvements to be carried out to electrical installations at following schools: Cockfield C.E. controlled (£490); Cornsay Colliery county (£475); Murton Colliery county (£581); Bishop Auckland girls' grammar (£2,500); and Houghton-le-Spring grammar (£2,700).

Falmouth. Design submitted by Lyons, Israel and Ellis, architects, 26 Seymour St, London, W.1, for erection of county secondary school has been selected. Cost estimated at £212,458.

Fleet (Hants) U.D.C. It is proposed to build 86 dwellings on Basingbourne site and 14 on Coxheath estate, Crookham.

Glasgow. Dean of Guild Court has approved plans for four primary schools at Drumchapel, Garthanlock, and Milton areas, and secondary school in Knightswood Rd. Estimated cost £430,000.

Greenock. Plans approved by Dean of Guild Court for bus garage in Port Glasgow Rd and Pottery St for Western S.M.T. Co., Ltd. Cost estimated at £127,000.

Grimsby T.C. Erection of three 3-storey block of (24) dwellings on Nunsthorpe estate. J. V. Oldfield, Borough Engineer and Surveyor, Municipal Offices, Town Hall Sq.

Hackney B.C. It is proposed to erect 36 flats at Mabley St site and 20 on Cecilia Rd site.

Haverfordwest T.C. Approval sought for erection of further 101 houses on City Rd, estate.

Heywood. Longdura Manufacturing Co. Ltd., of Factory Lane, Manchester, are to build new shirt factory in Miller St.

Hornchurch U.D.C. Erection of 11 blocks of four maisonnettes each on Front Lane site, Cranham. Surveyor's Dept., Council Offices.

Hull. Land to be acquired in Brooke St, for new casualty block for Royal Infirmary.

Kesteven. Scheme approved for extensions costing £50,000 at King's grammar school, Grantham.

Kilmarnock. Dean of Guild Court has approved erection of 108 houses at Bellfield.

Lambeth B.C. It is proposed to build 40 flats on site 32 at Tulse Hill.

Leicester T.C. Home for old people to be built on Eyres Mousell estate at cost of about £40,988.

Liverpool T.C. Construction of secondary grammar school for boys at Woolton; and same also for girls at Allerton. City Architect, Blackburn Chambers, Dale St., Kingsway.

London. G. Pidduck and Co. Ltd., propose erection of factory in Shirley St., E.16. Plans by R. J. L. Slater, 270 High St. North, E.12.

Mansfield. Extensions to be carried out at factory in Botany Ave, for Mansfield Hosiery Mills Ltd.

Middlesbrough T.C. Forty houses to be built at Park End, and 4 shops and 2 flats at Pallister Park.

Morpeth (Northumb) T.C. Scheme in hand for erection of another 78 houses, and new housing estate of 20 acres at Loansden to be developed.

Newark (Notts.) T.C. It is proposed to build 8 dwellings at Hatchet's Lane, 60 at Hawton Rd estate and 20 in Gorse Rd, Jersey St, and Eton Ave.

Newcastle-on-Tyne. Thomas Hedley and Co. Ltd. are planning erection of another factory and have site in mind about 15 miles from city. Funds being raised for additions to Brunswick Church School. Architect will be W. Stockdale, 73 Howard St., North Shields.

Northampton. Out-patients dept. to be built at General Hospital.

North Riding. Construction of new fire station at Richmond costing £18,000. County Architect, H. J. Knowles, County Hall, Northallerton.

Oundle and Thrapston R.D.C. Erection of 20 houses at Woodford and 11 at Barnwell. H. G. Kenyon, Council Offices, Midland Rd, Thrapston, nr. Kettering.

Paisley. Dean of Guild Court approved plans for extensions to works at Glenfield, for W. Fulton and Sons Ltd. Cost estimated at £60,000.

Portishead (Som.) U.D.C. Plans in hand to erect 143 houses, 135 flats, 6 bungalows and shops on Down Rd site.

Portsmouth. Plans in hand for additions to Rudmore Rd factory for Portsmouth Steel Co., Ltd.

Rotherham. Work to start soon on erection of new R.C. church at Harringthorpe Valley Rd, at cost of about £18,000.

Roxburgh. Council office extensions at Newtown, St. Boswells, are estimated to cost £50,000.

Rugby R.D.C. Erection of 34 houses in four sites. Council's Surveyor, 24 Warwick St, Rugby.

Sandbach (Ches). Murgatroyds Salt and Chemical Co., Ltd, are planning extensions which will cost about £1,500,000.

Scotland. Construction of 60 houses on Cunninghar site, Tillicoultry. Scottish Special Housing Assoc., 15-21 Palmerston Place, Edinburgh 12.

Scunthorpe T.C. Erection of 57 flats in four blocks in Lincoln Gardens. Borough Surveyor, Municipal Offices, 34 High St.

Sodbury (Glos.) R.D.C. has approved in principle proposals for township of not more than 3,000 houses in Yate-Chipping Sodbury area to house some of Bristol's overspill population.

Spilsby R.D.C. Power points are to be provided in all council houses not already so equipped but possessing an electricity supply.

Sunderland R.D.C. Negotiations in progress for site at East Herrington for erection of 60 houses.

Sunderland. New Methodist church proposed in Reddar Rd. Projects in early stages. Architects are S. W. Milburn and Partners, 9 Esplanade.

Thornaby-on-Tees T.C. It is proposed to build 120 houses on Site 5, and 80 at Humphrey's Field, Thornaby Rd.

Totnes. Site plans approved for 71 houses at Sanderspool Cross, S. Brent.

Tynemouth T.C. Houses and flats to be built in Walton Ave.

Wolverhampton T.C. Erection of 26 dwellings at Oxley and Bushbury. Borough Engineer, Town Hall.

Woolwich B.C. It is proposed to build 34 houses and 42 flats on Bostall estate.

Overseas

U.S.A. Mr H. P. Toppin, President of Fasco Industries Inc. 255 Union St North, Rochester 2, New York, would like to contact U.K. manufacturers of various products which might sell in U.S., and which the company could either market and sell on royalty basis or by outright purchase. Products include electric fans, ventilators, shaded pole induction motors and hydraulic stoplight switches, automatic reset circuit-breakers, and directional signal flashes.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

T.V. and Radio (Campden and Moreton) Ltd. Manufacturers of and dealers in electrical and mechanical apparatus and accessories, and in particular wireless and television sets, etc. Nom. cap.: £1,000. Dirs.: S. J. Wheatley, Homelea, Blackminster, nr. Evesham; and T. H. Pye, High St, Moreton-in-Marsh.

Bonneys (Engineers) Ltd., Mill Brow, Eccleston, nr. St. Helens. Agricultural engineers, mechanical and electrical engineers, tool makers, metal workers, etc. Nom. cap.: £8,000. Dirs.: W. Bonney, E. Bonney, G. S. Borton and J. Tait.

Bristol Channel Production Co. Ltd., 1 Museum Pl, Cardiff. Mechanical, general and electrical engineers, etc. Nom. cap.: £2,000. Dir.: J. Whittaker.

H. L. Elton Ltd., 42 Spring Gardens, Manchester. Manufacturers of and dealers in wireless, television and telephonic receiving apparatus, etc. Nom. cap.: £8,000. Dirs.: H. L. Elton and L. Percival.

Mason and Lewden Ltd., 123 Pall Mall, S.W.1. Manufacturers of and dealers in electrical apparatus, etc. Nom. cap.: £100. Dirs.: O. Mason and S. Benfield.

Cromartie Kilns Ltd., Parkhall, Weston Coyney, Staffs. To take over business of electric kiln manufacturers carried on as N. Bosson and Co., at Weston Coyney. Nom. cap.: £5,000. Permt dir.: N. Bosson.

George Shaw (Electrical and Sanitary Engineers) Ltd., 212 Alum Rock Rd, Birmingham 8. Nom. cap.: £5,000. Dirs.: A. J. Shaw and H. G. Shaw.

Denbigh and Son Ltd., 18 Bank St, Padiham. To take over business of radio, television and electrical dealer carried on at 131 Accrington Rd, Burnley, and 18 Bank St, Padiham, by H. Denbigh. Nom. cap.: £1,000. Permt dirs.: H. Denbigh and Mrs M. M. Denbigh.

T. Beadle Investment Co., Ltd. 8 Castle St, Hull. To finance agreements in connection with sale and purchase of artificial lighting apparatus, electrical plant, machinery, fittings and accessories, radio and television sets, refrigeration plant, etc. Nom. cap.: £25,000. Dirs.: G. H. Atkinson, G. Rutherford, R. D. Hought, F. A. Smith, T. Atkinson and W. M. Coates.

Bells Electric (M/C) Ltd., 31 Granby Row, Manchester. Dealers in electrical goods, etc. Nom. cap.: £1,000. Dirs.: M. Myers, J. Sabb and Mrs. S. M. Sabb.

Electronic Switchgear (London) Ltd., 47 Victoria St, S.W.1. Nom. cap.: £7,000. Dirs.: G. H. Symonds, B. R. Symonds and R. A. Sproule.

Minikay Ltd., Stevinson Hse, Fenchurch St, E.C.3. To acquire and exploit right to make, use, exercise and vend apparatus, equipment and articles and processes according to letters patent belonging to Isoleringsaktiebolaget W.M.B., of Ranangsgatan, 9-11 Goteborg, Sweden; to become registered user of trade mark "Minikay" in respect of installations for heating, refrigerating, drying and ventilating purposes, etc. Nom. cap.: £1,000. Dirs.: to be appointed by the subscribers. Subs.: H. J. Dean, The Pines, Hoppety, Tolworth, Surrey, and D. I. Wilson, 12 Whitehall, S.W.1.

Linney Components Ltd., 40/42 George St, W.1. Mechanical, electrical, automobile, aeronautical, marine and general engineers, etc. Nom. cap.: £5,000. Dirs.: W. L. Linney and Gwladys M. Linney, and L. P. Nicholls.

Richmond Refrigeration Co., Ltd. 1 Church Rd, Richmond, Surrey. To take over business of Richmond Refrigeration Co., carried on at Richmond by Raymond F. Morse and Anthony Holmes. Nom. cap.: £2,000. Dirs: R. F. Morse and A. Holmes.

Gazette Announcements

COMPANIES ACTS

Lincoln and Egerton Ltd. Resolution for voluntary winding-up passed at meeting on 3 June. R. G. R. Sisson of 2 South Quay, Great Yarmouth, has been appointed liquidator.

Almag Engineering Co. Ltd. Meeting of creditors will take place at 46 Pembridge Rd, Notting Hill Gate, W.11, at 3 p.m. on 30 June.

Beam (Electronic Engineers) Ltd. J. M. Clarke, senior official receiver, of Inveresk Hse, 346 Strand, London, W.C.2, the liquidator, released as from 4 June.

Heat (Advisory and Development) Ltd. Resolution for voluntary winding-up passed at meeting on 26 May when E. H. Goddard, Prudential Chambers, Banbury, was appointed liquidator.

Rectifiers Co., Ltd. Meeting to be held at Nuffield Hse, 41-46 Piccadilly, London, W.1, on 16 July at 12 noon, to receive liquidator's report.

Winding-up

H. G. Cockram Ltd., electrical contractors, Folkestone. First meeting of creditors held on 2 June under winding-up order made on 3 May. Official Receiver stated company was handicapped from start by lack of working capital, and its business was carried on with aid of unsecured loans and bank overdraft, guaranteed by the directors. No statement of affairs filed but according to Official Receiver's information liabilities amounted to £1,790, of which £1,285 was due to trade creditors. Assets said to comprise: bank balance £19; cash in hand £23; book debts £1,000. Resolution passed for appointment of N. W. Osborne, C.A., 11-12 Finsbury Sq, E.C.2, as liquidator, with committee of inspection.

BANKRUPTCY ACTS

First Meeting

Croydon. John F. Lighton and Alexander R. White, trading together as Heathers at 737 Sidcup Rd, New Eltham, S.E.9, and 119 Old Dover Rd, Blackheath, S.E.3. Meeting will be at 58-61 York Terr, Regent's Park, N.W.1, on 29 June at 11 a.m., and public exam at County Court, Croydon, on 23 Sept. at 11 a.m.

Appointment of Trustees

Leeds. Samuel Whitton and Leslie Whitton, trading together as F. Whitton and Sons, electrical engineers, at Church Place, Victoria Rd, Leeds. Trustee is R. B. Smith, acc., 3 Alfred St, Leeds.

Huddersfield. Donovan J. Hartshorne, mechanical and electrical engineer trading at 778 New Hey Rd, Huddersfield, and at Brook Royd Mills, Stainland, nr Halifax. Trustee is N. Smith, C.A., 12 Market St, Hebden Bridge.

Intended Dividends

Sheffield. Frank E. V. Hooper, electrical engineer trading as Hoopers Service Station, at Walkley Rd, Walkley. Last day for receiving proofs 3 July. Trustee is J. B. G. Moore, Official Receiver, 55 Queen St., Sheffield.

Dividends

Middlesbrough. John G. Milne, radio and electrical dealer trading at 34 Whitworth Rd, Grangetown. First and final dividends of 4s.7½d. in £ payable at 62-63 High St, Stockton-on-Tees, Durham, on 30 June.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

H.M.V. 717,042 Class 7. Food mixing machines. Gramophone Co., Ltd., Blyth Rd, Hayes, Middx.

Vertex. 724,772. Class 7. Mixing machines. G. J. Thordahl and Co., Welsh Cross Roads, Ledsham, Wirral.

Pye. B719,323. Class 9 B719,324. Class 11. Domestic electrical appliances. Pye Ltd., Radio Works, St. Andrews Rd, Cambridge.

Cecostat. 727,207. Class 9. Aquarium thermostats. Ceco Products, 19a Whittall St, Birmingham 4.

Pianovox. 727,959. Class 9. Sound reproducing and recording apparatus etc. V. L. B. Jordan, 75 Athol Rd, Meaton, Bradford.

Leocast. 728,302. Class 9. Electrical apparatus all encased in solid insulating material. Lion Switchgear Ltd., 12 The Green, Richmond, Surrey.

Powaid. 729,272. Class 10. Hearing aids. R. J. Coleman, 23 Somerville Gdns, Leigh-on-Sea and R. M. Pettitt, 9 Broadway, Hadleigh, Essex.

Lumenette. B727,448, Class 11. Lighting installations etc. Siemens Electric Lamps and Supplies Ltd., Caxton House, Tothill St, S.W.1.

Dragon Quinta. 729,149. Class 11. Air heating, conditioning and ventilating installations etc. **Dragon Venta.** 729,150. Class 11. Ventilating fans etc. Dragonair Ltd., Fitzherbert Rd, Farlington, Portsmouth.

Twinway. B727,704. Class 6. Specification includes metal rods for passing cables and the like through conduits. E. A. Ward and Co., 124 Brearley St, Birmingham 19.

MEETINGS TO NOTE

TUESDAY, 29 JUNE

I.E.E.—Summer meeting in Western Centre, continuing until 2 July.

THURSDAY, 1 JULY

INST. OF PHYSICS.—"Current Work at Bell Telephone Laboratories," Dr Karl Darrow. Royal Institn., Albemarle St, W.1, 6 p.m.

TELEPHONE RENTALS LIMITED

Difficult Conditions Successfully Surmounted

MR FRED T. JACKSON ON BROADENING BASIS OF OPERATIONS

THE 25th annual general meeting of Telephone Rentals Ltd., was held on 21 June in London, Mr Fred T. Jackson, O.B.E., COMP.I.E.E. (chairman and joint managing director) presiding.

The following is an extract from his circulated statement:

Once more I am pleased to be able to report that we have had a successful year, as you will see from the Accounts which show a further increase in profits. I feel this is a very satisfactory result, especially as the year under review has been very difficult and one which has called for a great deal of anxious thought and hard work by all concerned.

You will remember that in the period 1951-52 we were in considerable difficulties over finance owing to the then prevailing restrictions on capital issues and credit. In due course, these difficulties were overcome, but those of you who are industrialists will realise that when the planned progress of a company of our size with an extensive organisation is interrupted in this way, through no fault of its own, it is a very difficult matter after the organisation has been broken down to a certain extent, to reconstitute and build up anew. I might liken this to the fly-wheel of a large engine which is able to put out a great deal of power before it is run down and stopped.

I would like to take this opportunity of paying tribute to the whole of our staff and employees who are members of our Profits Participation Scheme, who on this occasion put their shoulders to the wheel and worked all hours. This is something that is rarely found in any industrial concern in like circumstances, and to my mind is a wonderful tribute to what I might call a partnership between the workers and the shareholders, and is something which cannot be recognised in terms of money.

Widening Scope of Operations

Your board of directors always have in mind the broadening of the basis of your business which makes for stability as a profit-earning organisation. In this connection your directors have not been unobservant of the trend of industry to transfer some of their manufacturing activities to the Dominions, either as assembly or actual manufacture. That being the case, there is bound to be a demand for the services which we supply in this country. As an example of this growth we could quote South Africa, Canada and Australia. As you know, a few years ago we opened up business in Johannesburg and in Cape Town. I am very glad to be able to tell you that this business is now very successful and is in a position to pay us for its requirements in equipment and also is earning satisfactory profits and will be able to pay a dividend for the past year.

Based on our experience in South Africa, during the past year we have opened an office in Toronto. We intend to limit our activities there around Toronto itself, and later on, open up in other parts of Canada, as the distances in that country are so enormous it would not pay us to spread our activities over the whole country.

We have also acquired a half-interest in a business in Australia which has a quite substantial rental revenue. I might say that this was a business started by us before the last war, but at the outbreak of war we sold our interest to Australian industrialists. The acquisition of 50% of this business has been financed from our own resources.

The Directorate

During the year we have lost the services of one of our Directors by death, Mr W. A. Jackson, who will be greatly missed at our regular Board Meetings. In his place we are fortunate enough to obtain the services of Sir Leonard Browett, K.C.B., C.B.E., who I am quite sure will be of very great value to us because of his unique experience of taxation problems and finance generally.

Your Directors also have decided to exercise the powers they have under the Articles, to appoint Executive Directors. We think that we should appoint two or three of our most promising Managers, having in mind that possibly this will be a very good training ground for one or more of them to become Directors.

Proposed New Issue

At the moment your company is quite well off for liquid funds, but it will be necessary to raise further capital to finance our overseas commitments and to provide us with a reasonable working capital at home. We accordingly submitted an application to the Capital Issues Committee, and it gives me great pleasure to be able to report that we have received their consent. We therefore propose to issue 640,000 Ordinary shares in the ratio of one to ten at present held, at 7s. 6d. per share, which will realise £240,000 gross. The Issue will be made direct to the shareholders for the proportionate number to which they are entitled and an application form will be provided to enable shareholders to apply for extra shares, should there be any not taken up.

You will have noticed from the Group Accounts before you that our liability for Excess Profits Levy amounts to £85,750. This is a very heavy sum, and when it is added to Income Tax and Profits Tax, you are bound to realise what a brake provision for such large sums for taxation is on the development of the business, and it seems to me that the heavy burden all industries in this country have to meet on account of taxation is such that in the long run it is bound to defeat its own ends, inasmuch as it prevents the earning of profits, which on a more reasonable basis of taxation would contribute very liberally to the revenue of the country.

The gross profit at £655,569 is another record and shows an increase of £38,683 over the previous year, but after deducting Profits Tax, Excess Profits Levy and Income Tax totalling £458,779 the net profit is £196,790, which is £14,814 less than the net profit for 1952. This result will help you to appreciate the force of my remarks on the penal effect of the present level of taxation.

During the year we managed to secure repayment of the remainder of our War Damage claims, as a result of which we received interest amounting to £8,643 which has been credited in the profit and loss account.

After providing for the transfer to General Reserve of £100,000 and the dividends on both the Ordinary and Preference Shares amounting to £97,900, we are left with an unappropriated balance of £121,575 to be carried forward to the current year.

Balance Sheet Features

The issued capital has increased to £2,000,000 by virtue of the £280,000 Bonus Issue made in May of last year, and the Share Premium Account has been reduced by £284,463 for the same reason.

The Revenue Reserves now stand at £800,000 after the transfer of £100,000 from the Profit and Loss Account.

The Shareholders' interests, consisting of Capital, Reserves and the unappropriated Profit Balance, amount to £2,969,380 as compared with £2,874,506 at the end of the previous year, and this sum is fully employed, as you can well see, in earning what I think may justly be termed a most satisfactory profit.

Turning now to the assets side of the balance sheet, the net value of the revenue-bearing installations is £2,529,885, which is equivalent to just over 1·5 years' rent.

Consolidated Accounts

The net profit of the Group before taxation is £702,430 compared with £667,068 for 1952. After providing for taxation, the transfers to Reserves, and Dividends, the balance of unappropriated profits carried forward and attributable to the Holding Company's Shareholders amounts to £177,078.

All the Subsidiaries of your company traded at a profit in 1953, with the exception of the two Canadian companies. The Canadian companies were only formed in September, 1953, and it is anticipated that we shall suffer further losses for the next year or two, until we are able to build up a reasonable Rent Roll, as this is an entirely new venture, and unlike our other Dominion Subsidiaries where we were able to take over going concerns with existing Rental Contracts.

Conclusion

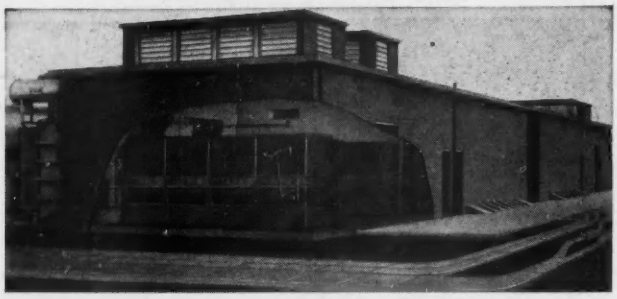
In concluding my remarks, I would venture the opinion that although business has hardened considerably in this country and competition has increased, we anticipate being able to obtain our fair share of orders in this current year. For the first four months of this year we have obtained the target figure which we have set ourselves.

As far as our two latest ventures in Canada and Australia are concerned, it is too early to prophesy.

The report and accounts were adopted and the final dividend of 6%, making 10% for the year, was approved.

IN TRACTION SERVICE IN 18 COUNTRIES ... Hewittic RECTIFIERS

the converting plant used by the World's principal railways

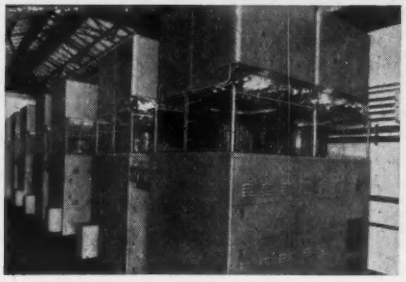


BRITISH RAILWAYS SOUTHERN REGION

One of 28 substations being equipped with Hewittic Rectifiers by the British Transport Commission for the Southern Region of British Railways. The photograph shows Wimbledon substation with one wall cut away to show the two 2,500 kW rectifiers in this half of the building.

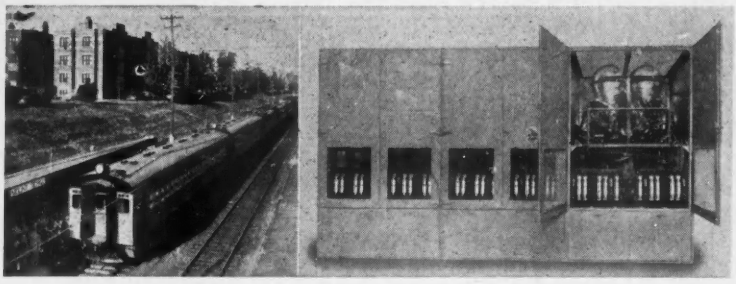
BRITISH RAILWAYS
LONDON MIDLAND REGION

A train passing one of the 14 Hewittic Rectifier substations on the Liverpool-Southport line. These have an aggregate capacity of 24,260 kW and supply 93 miles of electrified track. Hewittic Rectifiers installed on other sections of this region total 47,300 kW



LONDON TRANSPORT RAILWAYS

The 4,000 kW Bond Street substation, equipped exclusively with Hewittic Rectifiers. The plant comprises four 1,000 kW combined rectifier and enclosed air-cooled transformer units. This company is also responsible for the supply and installation of all A.C. and D.C. control gear. Some 90,000 kW of Hewittic Rectifiers have been supplied to the London Transport Executive.



CANADIAN NATIONAL RAILWAYS

The electrified section of the Canadian National Railways, comprising some 70 track miles in the vicinity of Montreal Terminal, is supplied with D.C. by Hewittic Rectifiers in two 3,000 kW substations at Central Station and Saraguay. The photographs show left, a train leaving Mount Royal Station, and right, one of the four 1,500 kW equipments in service. These are designed for operation at 3,000 volts, D.C.

* Send for Publication R200/3

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone : Walton-on-Thames 760 (8 lines) *Telegrams : "Electric, Walton-on-Thames"*

THERE'S SALES VALUE in a Metrovick Motor

Squirrel-cage and DC motors ranging from 1/50th to 1 h.p. are available for immediate delivery. Write for full details of the Metrovick range.

To the public, as well as to the engineer, Metrovick is a name to be trusted. When specifying fractional-horsepower motors for washing machines, refrigerators and other domestic or light industrial equipment choose Metrovick. The name guarantees trouble-free service and provides you and your retailers with a first-class sales feature.

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J/Q 301

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

AIREBOROUGH URBAN DISTRICT COUNCIL

INSTALLATION OF 250-W MERCURY DISCHARGE STREET LIGHTING ON ROUTE A658 BETWEEN CONEY LODGE, YEADON, AND APPERLEY BRIDGE, RAWDON

Distance—2¾ Miles (Approx.)

TENDERS are invited for the supply and installation of 250 W Mercury Discharge Street Lighting on Route A658 between Coney Lodge, Yeadon, and Apperley Bridge, Rawdon, an approximate distance of 2¾ miles. Separate tenders are invited as follows:

1. Supply and erection of columns and brackets and fitting and wiring of lanterns to columns, etc.
2. Supply of lanterns and all auxiliary gear.

A firm may tender for both, but the Council reserve the right to accept separate tenders from different firms.

Copies of the plan, instructions to persons tendering, specification, bills of quantities, forms of tender and schedule of rates and prices may be obtained from, and general conditions of contract seen at, the office of the Engineer and Surveyor to the Council at the address below on payment of a deposit of two guineas, which will be returned on receipt of a bona fide tender or the return of the documents.

Tenders, enclosed in a plain sealed envelope endorsed "Tender for Street Lighting," must be delivered to the undersigned not later than Monday, 12 July, 1954.

The Council does not bind itself to accept the lowest or any tender, and the acceptance of a tender or tenders will be subject to the obtaining by the Council of any requisite consents.

RALPH H. HULME,
Clerk of the Council.

Council Offices,
Micklefield House,
Rawdon, Nr. Leeds.
18 June, 1954. (K 220)

CITY OF DURHAM

TOWN HALL ELECTRICAL INSTALLATION

THE Council invites tenders for the rewiring of the Town Hall. Tendering particulars may be obtained from the City Engineer, Town Hall, Durham, on payment of the sum of £2. 2s. which will be refunded if a tender is submitted and documents returned.

Tenders must be delivered to my office on or before office closing time on Monday, 19 July, 1954, and no tender will be received except in a plain sealed envelope bearing the words "Tender for Town Hall Wiring" but not bearing any name or mark indicating the sender.

The Council does not bind itself to accept the lowest or any tender.

D. B. MARTIN-JONES,
Town Clerk.

32 Claypath,
Durham.
16 June, 1954. (K 248)

CITY OF MANCHESTER

HOUSES FOR POLICE

THE Watch Committee invites tenders for Electrical Installation work in 27 houses on various sites. Schedules and Tender Forms may be obtained on application to the Director of Housing, Town Hall, Manchester 2, on payment of one guinea, returnable on receipt of a bona fide tender. Tenders, which must be sealed in an official envelope endorsed "Electrical Installations—27 Police Houses," addressed to the Chairman of the Watch Committee, c/o The Town Clerk, must be received not later than Friday, 2 July, 1954. (K 290)

METROPOLITAN BOROUGH OF WANDSWORTH

SODIUM LAMPS

TENDERS are invited for the supply of 45 and 60 W Sodium Lamps and jackets.

Tender documents obtainable from the Borough Engineer at the undermentioned address, must be returned to me by noon, Wednesday, 7 July, 1954.

R. H. JERMAN,
Town Clerk.

Municipal Buildings,
Wandsworth, S.W.18. (K 282)

METROPOLITAN BOROUGH OF WANDSWORTH

STREET LIGHTING

TENDERS are invited for the supply and erection of Group "B" Standard Street Lighting.

Tender documents obtainable from the Borough Engineer at the undermentioned address, must be returned to me by noon, Wednesday, 7 July, 1954.

R. H. JERMAN,
Town Clerk.

Municipal Buildings,
Wandsworth, S.W.18. (K 281)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

TENDERS are invited for the Supply, Erection and Commissioning at Carolina Port Generating Station, Dundee, of the following:

Two 150,000 lb/hr Steam Generating Units and all Ancillary Apparatus; Steam Receiver and Steam Exhaust, Feed Water, Blow-down and Drain Piping; Modifications to Bunkers, Coal and Ash Handling Plant, etc.

Tender documents and drawings may be obtained on application to the undersigned on payment of Five Guineas which will be refunded on receipt of a bona fide Tender (which is not subsequently withdrawn) and the return of all documents.

Tenders should be delivered to the undersigned, together with all technical information required, in a sealed registered package marked "Confidential," not later than 12 noon on Monday, 20 Sept., 1954.

The Board do not bind themselves to accept the lowest or any tender.

P. PHILIP, M.I.MECH.E., M.I.E.E.
Area Manager.

7 Dudhope Crescent Rd,
Dundee.
June 1954. (K 283)

CITY OF GLOUCESTER

New Cattle Market, St. Oswald's Road

ELECTRICAL INSTALLATION

SPECIFICATION and plans will shortly be available for the electrical installation for the 40,000 ft super first instalment of this single storey building, now in course of construction.

Electrical Contractors desirous of tendering, and in a position to proceed expeditiously, should apply to the City Architect, Suffolk House, Gloucester, within ten days of this notice, enclosing a deposit of £2. 2s. which will be refunded upon receipt of a bona fide tender.

The Corporation do not bind themselves to accept the lowest or any tender.

(K 280)

CARDIFF CORPORATION TRANSPORT DEPARTMENT

UNDERGROUND CABLES

TENDERS are invited for the supply and delivery of underground cables required for a trolleybus extension scheme.

Specification and forms of tender may be obtained from the Transport General Manager, Central Offices, Wood St, Cardiff.

Tenders in plain sealed envelopes endorsed "Underground Cables—Ely Trolleybus Extension" but not bearing any name or mark indicating the sender, should reach the undersigned not later than first post on Thursday, 8 July, 1954.

The Corporation reserve the right to accept the whole or part of any tender.

S. TAPPER-JONES,
Town Clerk.

City Hall, Cardiff.
21 June, 1954. (K 291)

CITY OF MANCHESTER HOUSING COMMITTEE

TENDERS are invited for Electrical Installations on the following Contracts at Langley Estate:

Contract 207—42 Residential Flats.

Contract 210—292 Houses.

Schedules and tender forms may be obtained on application to the Director of Housing, Town Hall, Manchester 2, on payment of a deposit of one guinea, returnable on receipt of a bona fide tender. Tenders, which must be sealed in an official envelope endorsed "Electrical Installations" must be received by the Town Clerk not later than Monday, 28 June, 1954.

PHILIP B. DINGLE,
Town Clerk.
(K 237)

COUNTY BOROUGH OF SOUTHEND-ON-SEA

ELECTRICAL INSTALLATION

TENDERS are invited for the New Electrical Installation at (*a*) Bournemouth Park Junior and Infants' Schools, Bournemouth Park Road, Southend-on-Sea, and (*b*) West Leigh Primary School, Ronald Hill Grove, Leigh-on-Sea.

General Conditions may be inspected and copies of Form of Tender, Plans and Specification obtained on application to the Borough Architect, 30 Alexandra St, Southend-on-Sea, on payment of a deposit of £2, for each of (*a*) and (*b*) above, which will be refunded on receipt of a bona fide tender or the return of all loaned documents.

Sealed tenders addressed to the undersigned and endorsed (*a*) "Bournemouth Park School—Electrical Installation," and (*b*) "West Leigh School—Electrical Installation," are to be delivered to this office before 12 noon on (*a*) Monday, 5 July, 1954, and (*b*) Monday, 19 July, 1954.

No tender will be received except in the special envelope provided, which shall not bear any name or mark indicating the sender.

The Corporation do not bind themselves to accept the lowest or any tender.

ARCHIBALD GLEN,
Town Clerk.
(K 284)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Norfolk Sub-Area:

Sub-Area Headquarters Norwich

87/54.R

SENIOR ASSISTANT ENGINEER (COMMERCIAL)

Candidates should have had a sound experience in, and must be conversant with, all matters connected with a commercial organisation of a large but mainly rural area. They should also be conversant with sales and all aspects of service to consumers. Preference will be given to candidates who are Corporate Members of the Institution of Electrical Engineers.

Salary will be in accordance with Class J, Grade 4, of the National Joint Board Salary Agreement commencing at £1,026.

Apply to the Manager, Norfolk Sub-Area, Eastern Electricity Board, 4 Duke St, Norwich, Norfolk.

Yarmouth District

40/54.R

DEMONSTRATOR

Candidates should have had Domestic Science training including Electrical Housecraft, should preferably hold the E.A.W. Certificate and be competent to plan and give cookery demonstrations, including lectures and advice to consumers on the utilisation of domestic electrical appliances. Previous experience in an Electricity Service Centre is desirable.

Salary will be in accordance with Grade 1 (£400 x £20—£480 x £10—£490) of the National Joint Council Salary Agreement, although progress beyond £440 will be subject to a certificate that the person concerned is capable of undertaking all the duties of the grade.

Apply to the District Manager, Great Yarmouth, Eastern Electricity Board, Regent Rd, Great Yarmouth, Norfolk.

Future salaries and conditions of service for both these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience with details of present appointment and salary, should be submitted to the Manager concerned within fourteen days of the appearance of this advertisement. (K 268)

FOREMAN ELECTRICIAN

required by the SIERRA LEONE GOVERNMENT RAILWAY DEPARTMENT for one tour of 18 to 24 months. Commencing salary etc. according to age and experience in scale £798 rising to £1,178 a year with gratuity at rate of £100/£150 a year. British Railways staff may be appointed on secondment terms on salary etc. according to age and experience in scale £742 rising to £1,092 a year. Outfit allowance £60. Free passages for officer, wife and up to two children up to age of 10 or grant up to £150 a year for maintenance in U.K. Liberal leave on full salary. Candidates between 25 and 40 years, must have served apprenticeship and have at least 4 years' experience as a journeyman electrician. They must have experience of the maintenance and repair of all types of a.c. motors, 3-phase, 50 cycles up to 400 V, workshop lighting, 230 V, single-phase, also coil and armature windings. A knowledge of train lighting systems is essential. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30468/EE. (K 233)

YORKSHIRE ELECTRICITY BOARD

No. 7 (Grimsby) Sub-Area

Gainsborough District

SENIOR SERVICE CENTRE ASSISTANT

APPLICANTS should have had previous experience in Service Centre work including the sale of electrical appliances, Hire Purchase Agreements, handling of enquiries, etc., and must be capable of advising consumers on any matter relating to the use of electricity in their homes. A knowledge of window display will be an advantage.

Salary—N.J.C. Grade 2, £485/£545 per annum.

SALES REPRESENTATIVE

Applicants will be required to give advice within well defined instructions and under close supervision to both urban and rural consumers in respect of new supplies and sales of domestic and agricultural equipment and to advise consumers on all types of domestic and agricultural installations and prepare estimates in this connection.

Salary—N.J.C. Grade 1, £400/£490 per annum.

Scunthorpe District

DEMONSTRATOR

Applicants must have had two years' domestic science training at a recognised college and have obtained the E.A.W. Certificate. Previous experience of demonstrating to the public will be an advantage.

Salary—N.J.C. Grade 1, £400/£490 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 8 July, 1954.

No. 7 (Grimsby) Sub-Area

Grimsby District

METER REPAIRER (MECHANICIAN)

N.J.I.C. rate of pay and conditions of service the present rate being 3s. 9d. per hour for a 44-hour, 5-day week.

Scunthorpe District

JOINTER OR JOINTER (E.H.T.)

N.J.I.C. rate of pay and conditions of service the present rate for Jointer being 3s. 7d. per hour and for Jointer (E.H.T.) 3s. 9d. per hour for a 44-hour, 5-day week.

A house may be available in Scunthorpe for the successful applicant.

Applications, giving full particulars of age and experience should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 8 July, 1954.

No. 3 (Sheffield) Sub-Area

Sheffield North and South Districts

ASSISTANT INSTALLATION ENGINEER

Applicants should possess a sound technical training, have served a full apprenticeship with a recognised firm of Electrical Contractors and subsequently have a wide experience of all classes of electrical contracting work covering installations for lighting, heating and power. The duties of the post include the preparation of specifications, estimates and tenders for all classes of installation work. Application of I.E.E. Wiring Regulations and other relevant work including knowledge of rewinding and repair of electrical machinery. Layout and supervision of installations on site. Use of modern methods of estimating. Control of staff and workpeople.

Salary—N.J.B. Class L, Grade 12, £667/£692 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 8 July, 1954.

No. 5 (Wakefield) Sub-Area

Castleford District

INSTALLATION ENGINEER

The person appointed will be responsible for the organisation and administration of the contracting section including the supervision of manual workers. He must be capable of preparing specifications and estimates and supervising schemes for complete installations of all types and must have a

continued in next column

continued from previous column

thorough knowledge of the Electricity Supply Regulations and the I.E.E. Regulations for the Electrical Equipment of Buildings. Preference will be given to Corporate Members of the Institution of Electrical Engineers.

Salary—N.J.B. Class F, Grade 8, £635/£664 per annum.

Wakefield District

GENERAL ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district and undertake standby duties.

Applicants must have at least a Higher National Certificate in Electrical Engineering or equivalent qualifications.

Salary—N.J.B. Class F, Grade 11, £548/£565 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 8 July, 1954.

No. 1 (Bradford) Sub-Area

METER REPAIRERS (MECHANICIAN)

Required in the Meter Testing Section at Bradford. Rate of pay 3s. 9d. per hour, conditions of service in accordance with N.J.I.C. for the Electricity Supply Industry.

Applications, giving full details of age, and experience should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford, not later than 8 July, 1954. (K 262)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited from suitably qualified engineers for the following positions:

SHIFT CONTROL ENGINEER
LONGFORD POWER STATION, COVENTRY
Vacancy No. 85/54/ET

Applicants should have had a sound training and practical experience in a modern Power Station. The possession of technical qualifications is desirable.

Salary will be in accordance with Class G, Grade 10 (£608/£630 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 28 June, 1954.

JUNIOR ENGINEER
AVON POWER STATION, WARWICK
Vacancy No. 77/54/ET

Applicants should be suitably qualified Engineers with some experience in Power Station operation.

Salary for this appointment is £445 per annum within Class E, Grade 14, of the National Joint Board Agreement.

Closing date for receipt of applications 5 July, 1954.

ASSISTANT SHIFT CHARGE ENGINEER
AVON POWER STATION, WARWICK
Vacancy No. 87/54/ET

Applicants should have obtained Higher National Certificate in Electrical and/or Mechanical Engineering and have had experience in the operation of Generating Stations.

Salary for this appointment will be within Class E, Grade 9 (£587/£600 per annum).

Closing date for receipt of applications 5 July, 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box No. 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.
(K 203)

CENTRAL ELECTRICITY BOARD

Federation of Malaya

Deputy Station Superintendent

required by the above board. Option of appointment either (*a*) on agreement for three years with prospect of permanency or (*b*) on contract for three years with gratuity of £200/£280 for each year's service. Salary etc., according to qualifications and experience in scale £1,904 rising to £2,100 a year. In addition, allowances ranging between £210 and £630 a year payable to married men according to salary and dependants. Opportunity of terminating appointment at end of one year if so desired. Candidates must have wide experience of station maintenance and operation and preferably have held a similar position in a steam power station, of not less than 80 MW capacity or as a charge engineer for at least five years on a station of not less than 120 MW capacity.

Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/28769/EE.

(K 247p)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division

VACANCY No. 103/54.—THIRD ASSISTANT ENGINEER, No. 1 Sub-Division, Preston. Salary £649/£883 (AX/EX 5). Wide experience of power station operation required.

Applications, quoting Vacancy No., to Controller, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 5 July. (K 254)

ENGINEER TECHNICIANS

for Radiotherapeutic Institute in course of erection at the Western General Hospital, Edinburgh 4, which will contain one 4 MeV Linear Accelerator and eight other X-ray therapy units, to assist in problems related to the maintenance, adjustment and operation of equipment used in the treatment of patients.

CHIEF ENGINEER TECHNICIAN—Salary scale £630 x £20—£750 per annum.

SENIOR ENGINEER TECHNICIAN—Salary scale £540 x £20 (3) x £25 (1)—£625 per annum.

ASSISTANT ENGINEER TECHNICIAN—Salary scale £450 x £15 (3) x £20 (1)—£515 per annum.

Conditions of service as recommended by the Whitley Council for Health Services (P.T.B. Circular No. 28). The posts are superannuable.

Preference will be given to candidates who hold an appropriate degree or equivalent qualification. Placing on the scale will be according to experience. Previous experience with X-ray and/or high voltage equipment essential.

The Chief Engineer must be experienced in electrical and mechanical engineering. The Senior Engineer will require to have a good knowledge of electronics.

Applications, giving qualifications and experience, with the names and addresses of three referees, to be submitted immediately to the Medical Superintendent at the Hospital. (K 232)

THE NORTH WESTERN ELECTRICITY BOARD
APPOINTMENT OF DISTRICT ENGINEER, KEARSLEY DISTRICT

DUTIES will include the control of the District Engineering and Drawing Office Staffs and responsibility for the construction, operation and maintenance of the District distribution systems (overhead and underground). Corporate membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £1,068/£1,115 p.a. Grade G.2. N.J.B. Conditions.

Applications to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester 3, by 30 June, 1954. (K 253)

BRITISH ELECTRICITY AUTHORITY
South Western Division
TECHNICAL STAFF VACANCIES

(*a*) SENIOR ASSISTANT ENGINEER (Civil), Generation Construction Department, Bristol. N.J.B. 1AX/CX £970/£1,166.

(*b*) GENERAL ASSISTANT ENGINEER (Protection), Technical Department (Plymouth Region), N.J.B. 8AX/CX £501/£675.

Superannuation.

Candidates for (*a*) should preferably be Corporate Members of the Institution of Civil Engineers, be experienced in the design and construction of heavy foundations and building works associated with modern Power Stations; also in the preparation of preliminary Schemes and Estimates, Specifications, Bills of Quantities, in writing Reports, and general control of Building and Civil Engineering Contracts.

For (*b*) should possess qualifications leading to A.M.I.E.E. and have served with one of the leading electrical manufacturers. They should have an interest in protective gear design, generator and switchgear testing and fault current calculators.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 5 July, 1954. (K 255)

THE RIO DE JANEIRO TRAMWAY
Light & Power Co. Ltd.

A BRITISH Company in Brazil, invite applications from suitably qualified men for a post in Rio de Janeiro as TECHNICAL ASSISTANT—Meter Division. Candidates should be between 25 and 30 years of age, and should have a university degree or Higher National Certificate in Electrical Engineering, together with one to five years experience in the Meter Department of a large utility or manufacturer. Salary will be in accordance with qualifications and experience, taking into consideration local cost of living; three years' agreement subject to renewal, with first-class passage both ways; four months' leave on full pay after three years' service. Written applications, which will be treated in confidence, should be made to Mr W. P. Kellett, Joint Manager, Canadian-Brazilian Services Limited, 148 Leadenhall St, London, E.C.3. Applications should be received by 31 July, 1954. (K 231)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECTION ENGINEER (Operation) required in the Crewe District of the No. 4/5 Sub-Area. Salary £649/£681 p.a. (N.J.B. E/7). Appointment superannuable and subject to medical examination.

Applicants should preferably have the technical qualifications necessary to enable them to become Chartered Electrical Engineers, and should have experience in all branches of work associated with distribution, including design, construction, and operation of E.H.T., H.T., and L.T. overhead and underground systems including indoor and outdoor substation equipment. The District comprises both rural and urban areas.

Application forms obtainable from the Manager, No. 4/5 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date: 5 July, 1954. (K 243)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

APPLICANTS are invited for appointments as FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER in the undernoted Districts:

Clyde Sub-Area—Dumbarton District.
Lanarkshire Sub-Area—Hamilton District.
Dumfries and Galloway Sub-Area—Annan District.
Dumfries and Galloway Sub-Area—Kirkcudbright District.
Dumfries and Galloway Sub-Area—Wigtown District.

Except in the Wigtown District, the posts are on Class D, Grade 6, of the National Joint Board Agreement. Salary scale—£665/£688 per annum. In Wigtown District, the post is on Class C, Grade 6, salary scale £631/£654 per annum.

Applicants should be Engineers with commercial experience and, preferably, should hold an appropriate engineering qualification.

The appointments are superannuable and may be subject to medical examination.

Forms of application, which may be obtained from the applicant's appropriate Officer or the undersigned, should be completed and returned to the undersigned not later than 9 July, 1954. Applicants should indicate the District or Districts applied for.

Persons who have already submitted applications for a similar appointment need only indicate that they wish to be considered for one of the above positions.

J. MEEK,
Secretary.

62, Dalziel Drive,
Glasgow, S.1.
23 June, 1954. (K 234)

BRITISH ELECTRICITY AUTHORITY
South West Scotland Division

GENERAL ASSISTANT ENGINEER
SYSTEM OPERATION DEPARTMENT

THE vacancy occurs for a General Assistant Engineer in the Control Room, Divisional Headquarters, 168 Broomhill Drive, Glasgow W.1. Higher National Certificate or equivalent experience in a Power Station will be advantageous.

The salary for the superannuable post is in Grade 8, Class AX, Schedule C, of the National Joint Board Agreement, £501/£639 per annum. The duties—day work—are statistical.

Applications on Form AE6 which may be obtained from Divisional Headquarters or from any Divisional Office of the Authority should be forwarded to me at the above address before 5 July, 1954.

A. CHRISTIANSON,
Divisional Secretary.

15 June, 1954. (K 265)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

JUNIOR ENGINEER is required at Hams Hall "B" Power Station, Nr. Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K15, of the Agreement, £545 per annum.

Applicants should have received a sound technical training and should preferably have had experience in a large power station. Appropriate technical qualifications will be an advantage.

Apply quoting Vacancy No. 693MD on forms AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 10 July, 1954. (K 252)

BRITISH ELECTRICITY AUTHORITY
Headquarters

BANKSIDE, London, require DRAUGHTSMEN for work on either:

(*a*) Civil and Building Works in connection with outdoor Grid Substations, or

(*b*) Electrical Layouts and Diagrams for Grid Substations.

Salary N.J.B. Grade 6, Schedule D, £458/£595 (inclusive) according to qualifications and experience. Pension Scheme. One Saturday morning in four on duty. Forms from D. Moffat, Director of Establishments, Winsley St, London, W.1. Quote reference: AE/491/E.T. (K 270)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited from suitably qualified engineers for the following positions:

Vacancy No. 87/54/ET
ASSISTANT SHIFT CHARGE ENGINEER, AVON POWER STATION, WARWICK

Applicants should have obtained Higher National Certificate in Electrical and/or Mechanical Engineering and have had experience in the operation of Generating Stations.

Salary for this appointment will be within Class E, Grade 9 (£587/£600 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications, 5 July, 1954.

Vacancy No. 93/54/ET
ASSISTANT ENGINEER (INSTRUMENTS), FREEMEN'S MEADOW POWER STATION, LEICESTER

Applicants should have the Higher National Certificate or equivalent together with sound practical experience in the maintenance of instruments in a P.F. fired Generating Station.

Salary for this appointment will be within Class H, Grade 10 (£641/£667 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 12 July, 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

18 June, 1954. (K 261)

SOUTH EASTERN ELECTRICITY BOARD

DEMONSTRATOR (FEMALE)
Sutton District

SALARY £400 x £20—£480 x £10—£490 p.a. plus London Weighting under N.J.C. Grade 1. Superannuable. The person appointed will be required to conduct demonstrations of domestic electrical appliances in consumers' homes and in showrooms, advise consumers and generally assist in showrooms. Preference to applicants having the E.A.W. Certificate or a recognised Domestic Science qualification.

Applications on forms from C. W. Emanuel, M.I.E.E., Sutton Manager, SEEBoard, 52 High St, Sutton, Surrey, to be returned naming two referees by 7 July, 1954.

CARTOGRAPHIC DRAUGHTSMAN (MALE) (NJC)
Guildford District

Salary £415 x £20 x £15 x £20—£470 p.a. Superannuable. Applicants should have sound general education and experience in drawing office practice is necessary.

Applications on forms from W. E. Affleck, M.I.E.E., M.INST.F., Guildford Manager, SEEBoard,, 99 High St, Guildford, Surrey, to be returned by 7 July, 1954.

JOINTER (EXTRA HIGH TENSION)
Worthing District

Wages 3s. 9d. per hour for 44-hour, 5-day week, under N.J.I.C. Agreement.

Applications, naming two referees to M. J. Mortimer, M.I.E.E., District Manager, Worthing District, SEEBoard, 56 Chapel Rd, Worthing, by 7 July, 1954.

A. L. BURNELL,
Secretary.
(K 266)

SOUTHERN ELECTRICITY BOARD

METER REPAIRER (MECHANICIAN)

METER Department of No. 2 (Newbury) Sub-Area. Wages as set out in the N.J.I.C. Agreement (i.e. 45d. per hour). N.J.I.C. Conditions of Service.

Experience in the repair and/or testing of all types of A.C. single-phase and polyphase electricity meters would be an advantage.

Applications in writing to the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, not later than 9 July, 1954. (K 269)

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London Allowance.

Vacancy No. 54/471
SENIOR ASSISTANT ENGINEER (MECHANICAL ENGINEERING) CONSTRUCTION DEPARTMENT—DIVISIONAL HEADQUARTERS

Applicants should have considerable experience in Generating Station construction work, including the preparation of station and system layouts and specifications for all types of mechanical plant, handling of contracts and supervision of site erection. Some station operating experience would be an advantage. Preference will be given to engineers with an engineering degree or corporate membership of the Institution of Mechanical Engineers. Salary—Class AX, Grade 1=£1,018. 10s. / £1,153 p.a. rising ultimately to Class EX, Grade 1=£1,282 p.a.

Vacancy No. 54/472
SHIFT CHARGE ENGINEER—HAMMERSMITH GENERATING STATION

Applicants should have a sound technical training and practical experience in the operation and maintenance of boilers, turbines, and E.H.T. switchgear. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage. Salary—Class D, Grade 7=£664. 13s. p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (K 271)

W. T. HENLEY FELLOWSHIP

THE Governors of Queen Mary College invite applications for a W. T. Henley Fellowship. The Fellowship is tenable for two years and may be extended for a third. The successful applicant will be expected to do research work in Electrical Engineering and the College facilities are particularly good for research work in dielectrics, high voltage engineering and arc-interruption phenomena.

The Fellowship should be particularly attractive to those who wish to obtain a Higher Degree or wish to re-enter the University with a view to an academic career. Candidates should possess a good University degree in Electrical Engineering or in Physics. They should preferably have had research or industrial experience.

Remuneration £600 to £900 per annum according to qualifications and experience.

Application forms, obtainable from The Registrar, Queen Mary College (University of London), Mile End Rd, E.1, should be returned as soon as possible and in any case not later than 19 July. (K 272)

BRITISH ELECTRICITY AUTHORITY
Yorkshire Division

REQUIRE a SECOND ASSISTANT ENGINEER (Electrical), Generation Construction Department, Rotherham.

Salary £834/£1,053 per annum, Grade 2, Class AX/DX, National Joint Board Agreement (Schedule C).

Applicants should have educational and engineering experience up to the standard required for Associate Membership of the Institution of Electrical Engineers, and should have had experience in the design and installation of turbo-alternators, switchgear, transformers and cables up to 33 kV, and other electrical equipment associated with a modern power station. Experience in the preparation of specifications and estimates would be an advantage.

Application forms obtainable from the Divisional Secretary (Establishments), British Electricity House, St. Mary's Rd, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(K 267)

THE SOUTH WALES ELECTRICITY BOARD

REQUIRED ASSISTANT CIVIL ENGINEER responsible to the Board's Civil Engineer.

Successful candidate will be responsible for civil engineering work mainly in the Eastern part of the Board's area.

The work will include the carrying out of contracts both by direct labour and outside contractors, preparation of estimates and specifications, reports and advice on land and property for substations, offices and showrooms and supervision of the preparation of working drawings.

Salary—Class AX/CX Grade 5 (£649/£835) of N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience, and three referees, to be addressed to the Secretary to arrive by 3 July, 1954.

D. G. DODDS,
St. Meilons, Secretary.
Cardiff. (K 264)

THE SOUTH WALES ELECTRICITY BOARD

REQUIRED JUNIOR ENGINEER (Protection) based at Fforestfach in the West Central Sub-Area.

Successful applicant will be required to assist the Protection Engineer in carrying out commissioning and maintenance tests on all classes of protective gear on the Board's distribution system and should have had a sound engineering training.

Salary—Class AX/CX Grade 9 (£390/£556) of N.J.B. Schedule, commencing at £417 per annum.

Applications stating age, present position and salary, qualifications, experience, and three referees, to be addressed to the Secretary to arrive by 3 July, 1954.

D. G. DODDS,
St. Mellons, Secretary.
Cardiff. (K 263)

EAST RIDING OF YORKSHIRE COUNTY COUNCIL

APPOINTMENT OF ELECTRICAL ENGINEERING ASSISTANT

APPLICATIONS are invited for the appointment of an Electrical Engineering Assistant on the staff of the County Architect's Department at a salary in accordance with A.P.T. Grade II (£520/£565 per annum).

Candidates will be required to provide evidence of satisfactory experience in the employment of an electrical contractor or Local Authority, and in the design, supervision and maintenance of electrical installations.

The appointment is superannuable and subject to the passing of a medical examination.

Applications, giving particulars of age, training, qualifications, experience, past and present employment (with salaries) and accompanied by copies of three recent testimonials, should be addressed to the County Architect, County Hall, Beverley, and must be received by him not later than Friday, 9 July, 1954.

THOMAS STEPHENSON,
County Hall, Clerk of the Council.
Beverley.
June, 1954. (K 285)

APPLICATIONS are invited by the Electrical Research Association from GRADUATES in Physics, Engineering, Mathematics or Physical Chemistry for fundamental and applied research in various applications of electricity. Starting salaries are from £475 to £600 p.a. for those with post-graduate qualifications or from £600 to £800 p.a. for those with higher qualifications. Appointments are eligible for superannuation under the F.S.S.U. Application should be made to the Director, E.R.A. Laboratory, 5 Wadsworth Rd, Greenford, Middlesex. (K 210)

BOLIVIA. Canadian Electrical Utility operating in La Paz Bolivia, requires services of an ELECTRICAL DISTRIBUTION ENGINEER. Salary 5,600 United States dollars per year. Three years' tour with paid leave. Single or married without children, aged 25-30. Particulars to—Box No. 3613, Electrical Times. (K 185)

CROMPTON PARKINSON LTD., Chelmsford, require person capable of dealing with enquiries and orders for automatic and manual starters and control gear, including Automatic Voltage Regulators for use with a wide range of A.C. and D.C. motors and generators. Superannuation scheme, extensive sports, social and welfare facilities. Write stating age, present salary, etc., to the Personnel Officer. (K 214)

CONSULTING Engineers in London require DRAUGHTSMAN for preparation designs, drawings and specifications for lighting and power installations; minimum age 25; salary not less than £625 per annum. Apply with full particulars to—Box No. 3611, Electrical Times. (K 184)

COMMISSIONING ENGINEERS required by a well-known firm of Consulting Engineers. Duties will involve the commissioning of new boilers, turbo-alternators and power station plant and in some cases these plants are situated overseas.

Candidates will have to be prepared to attend foreign sites for short periods to commission plant.

Applicants must have had a number of years' experience in the operation of power plant and experience with diesel engines would be an advantage. The salary offered will be in accordance with the applicant's experience and qualifications. Applications should be forwarded to the Personnel Officer, Ewbank and Partners Ltd., 10/11 Grosvenor Place, S.W.1. (K 257)

CONTRACTS ENGINEERS required for handling of Switchgear tenders and contracts. Applications should state age, experience, qualifications and salary required and should be addressed to Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. (K 256)

DRAUGHTSMAN required for Electric Elements and Thermal Devices Manufacturers. Knowledge of presswork and press tool design an advantage. A distinct opportunity. House available if required. Five day week. Pension Scheme, Canteen, etc. State briefly age, experience, technical training, salary, whether married with family, to—Works Manager, Best Products Ltd., Felixstowe, Suffolk. (K 258)

DRAUGHTSMAN required for Switchgear development work. Good salary offered to suitable applicant. Pension Scheme available. Reply stating age, salary, full details of technical qualifications and experience to Erskine, Heap and Co., Ltd., Lancashire Switchgear Works, Salford, Manchester 7. (K 192)

DRAUGHTSMAN required as assistant to Design Engineer. This is a unique opportunity for a keen young man with experience in the design and detail of electro-mechanical devices. Applicants must be willing to undertake all duties connected with a Drawing Office, and should be of at least O.N.C. standard. Five-day week, canteen facilities, paid holiday this year. Salary £500/£650 per annum, depending upon experience. Company situated 20 miles north of London. Our staff have been advised of this appointment. Write giving full details to—Box No. 3597, Electrical Times. (K 142)

ELECTRICAL DESIGNERS AND DRAUGHTSMEN required permanently. Experience in lighting and power. Installations for Schools, Hospitals, and other large Institutions. Five day week. Excellent prospects. Interview expenses refunded. Confidential applications to E. G. Phillips Son and Norfolk, Consulting Engineers, Arskus House, Annesley Grove, Nottingham. (K 156)

ELECTRICAL RESEARCH ASSISTANT. A large organisation in the North West wishes to appoint a young man to evaluate the electrical properties of new insulation products. Possession of Higher National Certificate in Electrical Engineering is desirable. Apply to—Box No. 3619, Electrical Times. (K 219)

DESIGNER DRAUGHTSMAN required for design and development of test gear to meet production demands of Thermionic Valves and Cathode Ray Tubes. Applicants should have good mechanical knowledge with previous experience in mechanical and electrical interlocks, component layouts for Power Supply Units up to 50 kV, 50 cycles, and R.F. or Induction Heaters. Housing facilities available near factory area. Write, stating age and full details of previous experience and technical training to the Edison Swan Electric Company Ltd., Eastern Industrial Area, Harlow New Town, Essex. (K 286)

DRAUGHTSMAN required for detailing mechanical and electrical assemblies. Must be capable of reading electronic circuits. Applicants with any previous experience on Sheet Metal Cubicles, H.V. Power Supply Units, Induction Heaters or Radio and Television layouts should write stating age and full details of previous experience and technical training. Housing facilities available near factory area. The Edison Swan Electric Company Ltd., Eastern Industrial Area, Harlow New Town, Essex. (K 287)

ELECTRICAL ENGINEER, aged 30-40, preferably Chartered, required for leading position in Design Office of London Company manufacturing automatic precision machinery. Previous drawing office and industrial experience of control gear and mechanisms essential. Responsible progressive staff appointment (contributory pension scheme). Apply Box No. 3627, Electrical Times. (K 235)

ELECTRICAL ENGINEER for Sales.—Midland Silicones Ltd., an associated company of Albright and Wilson Ltd., require a qualified Electrical Engineer as Assistant Manager of the Electrical Department in the London Office. The duties comprise the marketing of Silicones to the Electrical Industry, and provide great scope for the use of energy and initiative. Some travel is involved. H.N.C. in Electrical Engineering is a minimum qualification. Considerable experience in the use of insulating materials would be an advantage. Age 25-35. Good commencing salary and membership of non-contributory pension scheme. Apply to the Appointments Officer, Albright and Wilson Ltd., Oldbury, Birmingham. (K 250)

ELECTRICAL DRAUGHTSMAN, 25-30, preferably familiar with heavy industrial plant, practice and layout.

Knowledge of distribution systems up to 3,300 V. A.C. and D.C. motor control schemes and preparation of schematic diagrams.

Salary depending on age and experience. Superannuation scheme.

Applications to be received by 19 July addressed to Electrical Engineer, Guest Keen Iron and Steel Works, Cardiff. (K 171)

ELECTRICAL CONTRACTS ENGINEERS required by Cooke and Ferguson Limited, Switchgear Specialists, Manchester.

Vacancies must be filled for posts of Section Leader Level on high voltage contracts work for the B.E.A. and overseas customers.

Applicants must have Higher National Certificate and be able to control a section of the Drawing Office.

Salary rates above association levels resulting from Staff Assessment Scheme for applicants with the satisfactory qualifications.

Reply stating experience and qualifications to Personnel Officer, South St, Openshaw, Manchester 11. (K 175)

ESTIMATOR for Indoor Sales Staff required by Crompton Parkinson Ltd., Chelmsford. Applicants must have initiative and be experienced in dealing with enquiries relating to A.C. and D.C. rotating electrical machinery up to 1,500 h.p. /kW. Superannuation scheme, and extensive social, sports and welfare facilities. Write, giving fullest particulars, to the Personnel Officer. (K 213)

ELECTRICAL MACHINE DESIGNER. A. Reyrolle and Company Ltd., have a vacancy in their Rotary Equipment Department for an Engineer to assist in the design and development of A.C. generators and motors, including commutator motors. Applicants should have had training and experience in this class of work and should possess at least the Higher National Certificate in Electrical Engineering. Preference will be given to Corporate Members of the Institution of Electrical Engineers. Please apply with full particulars to the Chief Engineer, A. Reyrolle and Company Ltd., Hebburn, Co. Durham. (K 245)

JOHNSON and Phillips require an ESTIMATOR AND TECHNICAL CORRESPONDENT in their Transformer Department. Preference will be given to a man experienced in the preparation of Tenders for the home and export market. Applications giving particulars of training and experience, together with age and salary required to Employment Manager, Johnson and Phillips Limited, Charlton, London, S.E.7. (K 173)

JOHNSON and Phillips Limited have vacancies in their CABLE ESTIMATING DEPARTMENT, preference will be given to men experienced in preparation of estimates of cost of rubber insulated cables and flexibles also thermosplastic cables. Applications giving age, experience and salary expected should be addressed to Employment Manager, Messrs Johnson and Phillips Limited, Victoria Way, Charlton, London, S.E.7. (K 135)

MANAGER for Electrical Repair and Maintenance organisation in N.E. Lancashire. Applicant must have Repair Shop experience and be capable of handling maintenance contract work.—Box No. 3589, Electrical Times. (K 121)

OUTSIDE SALES ENGINEER required by company manufacturing electrical rotating machinery one to 100 h.p. The successful applicant will be based at Loughborough, Leics, and will have to cover the East Midlands area. Possession of Ordinary National Certificate in Electrical Engineering is a necessary qualification and previous experience of this range of products is essential. Salary dependent upon qualifications and experience. Non-contributory superannuation scheme.—Box No. 3607, Electrical Times. (K 172)

OVERHEAD LINE ENGINEER required by Consulting Engineers for supervision of work in North Scotland and Outer Islands. Applicants should have had experience in the design and construction of overhead lines up to 33 kV. Salary according to experience.

Applications together with details of education, training and experience should be sent to Messrs Kennedy and Donkin, 3 North Charlotte St, Edinburgh 2. (K236)

PIRELLI-GENERAL Cable Works Ltd. have vacancies for ENGINEER AND ASSISTANT ENGINEERS having experience in construction of Steel Tower Transmission Lines. Applicants must be willing to travel. Apply in writing giving full particulars of experience, etc., and salary expected, to Overhead Lines Department, Eastleigh, Hants. (K 216)

PIRELLI-GENERAL Cable Works Ltd. have a vacancy for a capable GENERAL FOREMAN with sound experience in construction, supervision of labour and all round organising ability for erection of Steel Tower Transmission Lines. Apply in writing giving details of experience, etc., and salary expected to Overhead Lines Department, Eastleigh, Hants. (K 217)

REPRESENTATIVES with established connections amongst Electrical Retailers required. Commission basis.—Box No. 3633, Electrical Times. (K 260)

SALES MANAGER required for Electrical Wholesale firm (E.W.F.).

Current experience in similar business is essential and applicants should have wide range of personal contacts.

Applications, which will be treated with strict confidence, to Managing Director.—Box No. 3635, Electrical Times. (K 288)

THE GENERAL ELECTRIC CO., LTD., have vacancies on the staff of their SALES ORGANISATION in London for young men of Ordinary National Certificate Standard in Electrical Engineering. Excellent opportunities for promotion exist for those interested in sales of most types of electrical equipment and in work on the drawing board. Applicants, having drive and initiative, should have had a sound general education and preferably previous experience in a Sales Organisation. Apply in writing, quoting reference "Gen.", to The Staff Manager, Magnet House, Kingsway, London, W.C.2. (K 274)

THE GENERAL ELECTRIC CO., LTD., has vacancies at the Head Office of their Sales Organisation for men who are interested and have had experience in COMMERCIAL COOKING AND CATERING ENGINEERING. Applicants should be in the age group 25/30 years and possess the Ordinary National Certificate—preferably H.N.C. in Electrical Engineering and be familiar with equipment used in the forementioned. Apply in writing, quoting ref.: I.H. to the Staff Manager, Magnet House, Kingsway, London, W.C.2. (K 273)

THE GENERAL ELECTRIC CO., LTD., will be pleased to receive applications from young men in the age group 25/30 years who are interested in the commercial application of electric heat to industry. Vacancies exist in the Head Office of the SALES ORGANISATION for those who have had experience in this type of work and have a minimum technical standard of Ordinary National Certificate. There are excellent prospects for promotion. Apply in writing, quoting reference P.H., to The Staff Manager, Magnet House, Kingsway, London, W.C.2. (K 249)

THE EXPRESS LIFT CO., LTD., wish to engage ELECTRICAL DRAUGHTSMEN with experience in design of circuits and equipment. Applicants should be over 23 years of age and preferably have had experience in the lift industry. Apply in writing to Personnel Manager, Abbey Works, Northampton. (K 244)

WANTED. First class ELECTRICIANS, preferably with contracting experience. Good opportunity and permanency for suitable men. Good prospects. Apply, Lee, Beesley and Co., Ltd., 6 Warwick Row, Coventry or Lee, Beesley and Co., Ltd., 41 Snow Hill, Birmingham 4. (K 238)

APPOINTMENTS FILLED

BERMUDA ELECTRIC LIGHT CO., LTD. Applicants are informed that both posts previously advertised have been filled. (K 195)

SAN SALVADOR. Applicants are informed that the post advertised has been filled. (K 196)

APPOINTMENTS WANTED

ARGENTINA. Chartered mechanical electrical engineer, British, 56, fluent Spanish, own city offices, would handle firm's S. American projects, appraisals. Write DBP, B. Mitre 341, Buenos Aires. (K 178)

WANTED

WANTED, D.C. and A.C. ball-bearing MOTORS, motor generator sets, dynamos and alternators.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London, N.1. (K 3)

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (K 4)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (K 1)

DIESEL ELECTRIC GENERATOR SET, approx. 20 kVA, 50 cycle, 230/400 V. Green Brothers (Electrical) Ltd., Brackley, Northants. (K 239)

WANTED—Scrap Lead, Brass, Copper; top prices: Recovered Mercury (quicksilver) 15s. lb upwards. Spot cash on delivery, or cash on collection arranged Greater London area: also Platinum and Silver Contacts, precious and non-ferrous scrap metals in all forms. Belgrave Buyers (E.T.), 5 Belgrave Gardens, London, N.W.8. MAI 7513. (K 176)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (K 10)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (K 15)

FISHER FOUNDRIES LTD., Greet, Birmingham 11, for Machine Moulded Precision Castings in gun metal and soft grey iron. Tel.: Victoria 0197. (K 18)

CABLE JOINTING, up to and including 11 kV. Specialists on installations where aluminium cabling is specified. First class workmanship guaranteed, terms very reasonable. Special concessions to Private Electrical Contractors. Replies and enquiries to—Box No. 3625, Electrical Times. (K 229)

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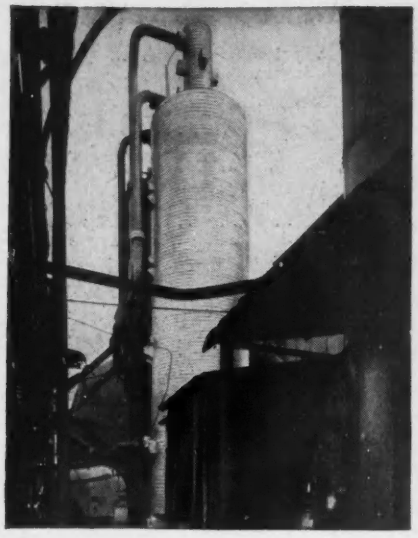

The photograph shows the insulation and protection of a 40 ft. high liquid CO_2 storage vessel at a large Essex chemical works. The vessel is insulated with Onazote, which is externally finished with a bitumen compound, and finally wrapped with Aluminium painted DENSELT TAPE.

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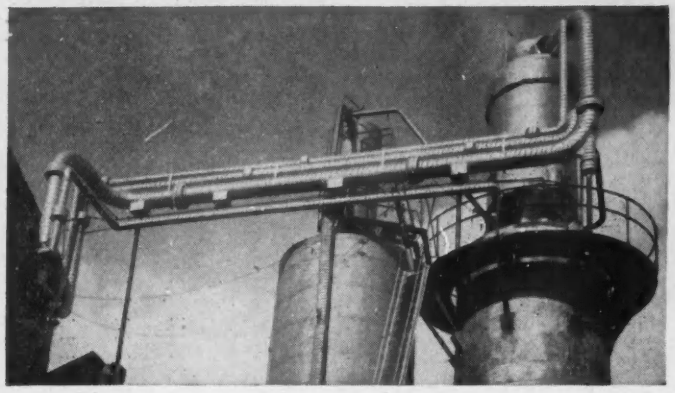

The photograph, taken at a large chemical works in London, shows the insulation and protection of exposed pipes. These are insulated with Onazote, wrapped with adhesive tape, followed by plastic bitumen dressing and finished off with Aluminium painted DENSELT TAPE, spirally wrapped over the plastic bitumen dressing.

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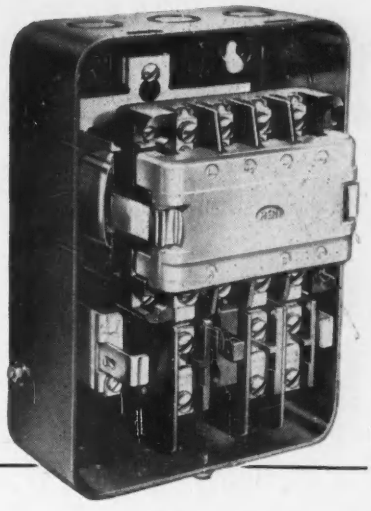

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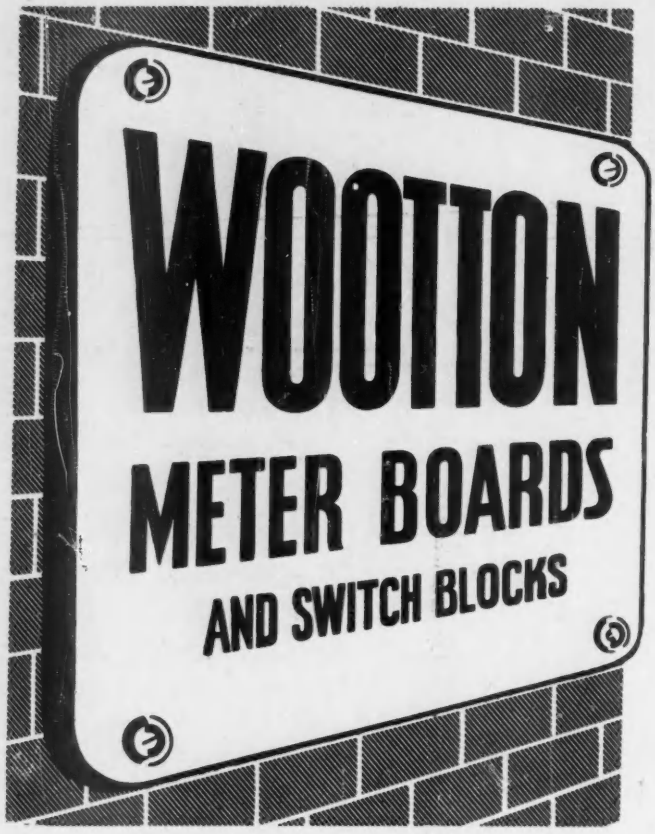

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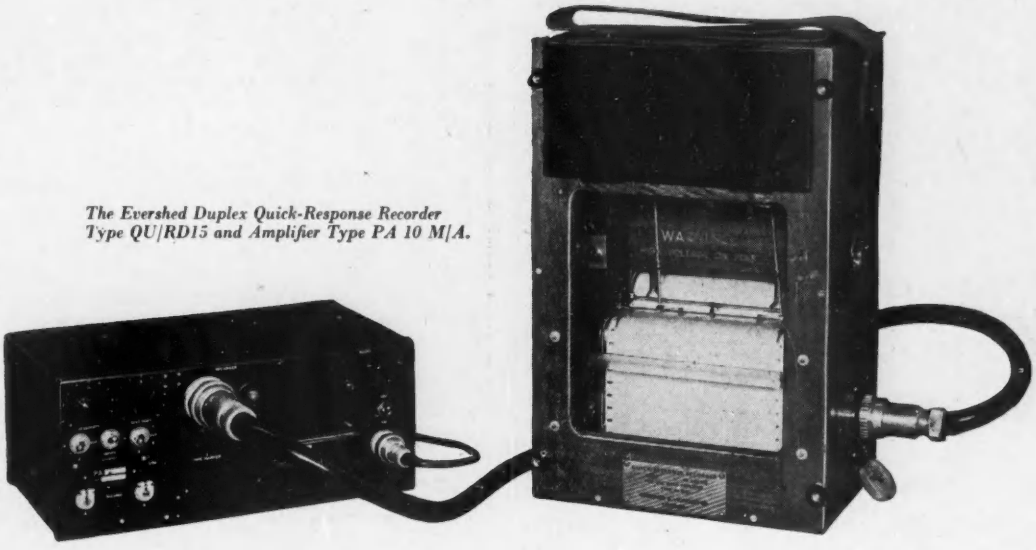

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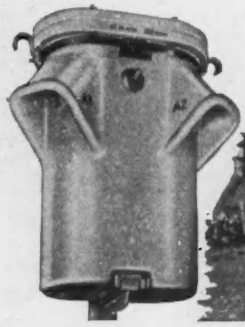

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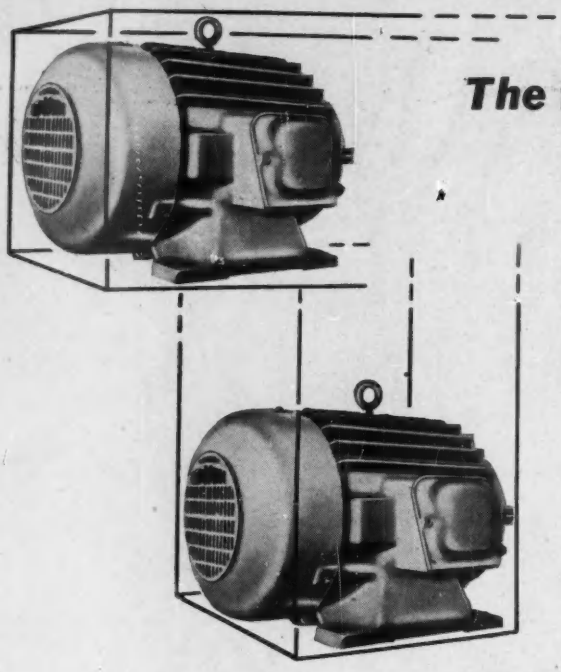

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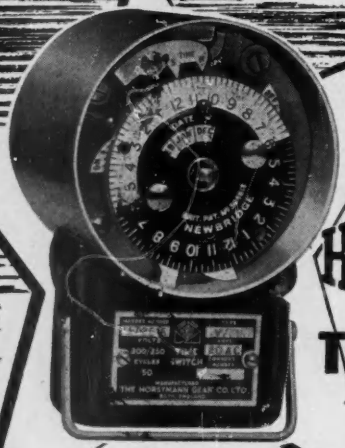

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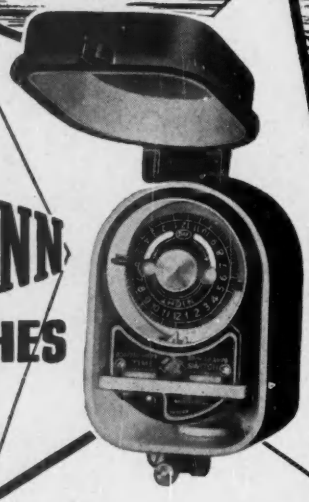

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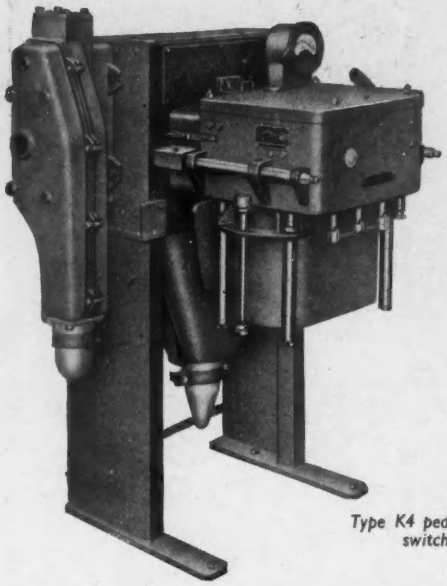

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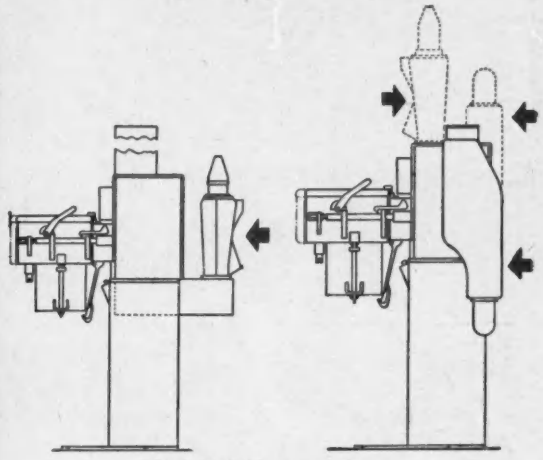
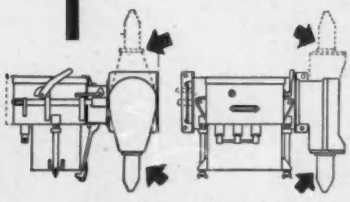
The type "K" range of industrial switchgear has been designed for use on systems up to 660 volts and for normal current ratings up to 1,200 amp. It complies with Factory and Home Office Regulations and is eminently suitable for installation in situations where reliability and robust construction are essential. The oil circuit-breakers have been short-circuit tested to prove the rating to comply with the appropriate British Standard. All circuit-breakers are subjected to a series of routine mechanical and electrical tests to ensure that manufacture is up to the required standard.

The "K" unit is of welded sheet-steel construction, incorporating horizontal drawout, fully interlocked oil circuit-breaker, the metalclad construction providing complete enclosure of all connections.

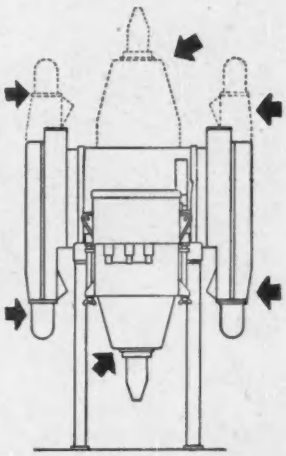


Pedestal Mounted Type

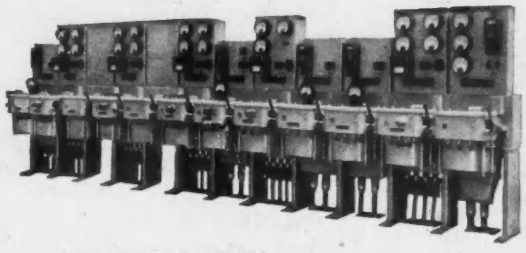
ALTERNATIVE CABLE BOX POSITIONS



Wall Mounted Type



Pedestal Mounted Type



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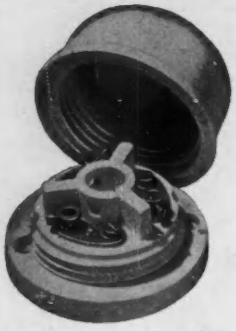

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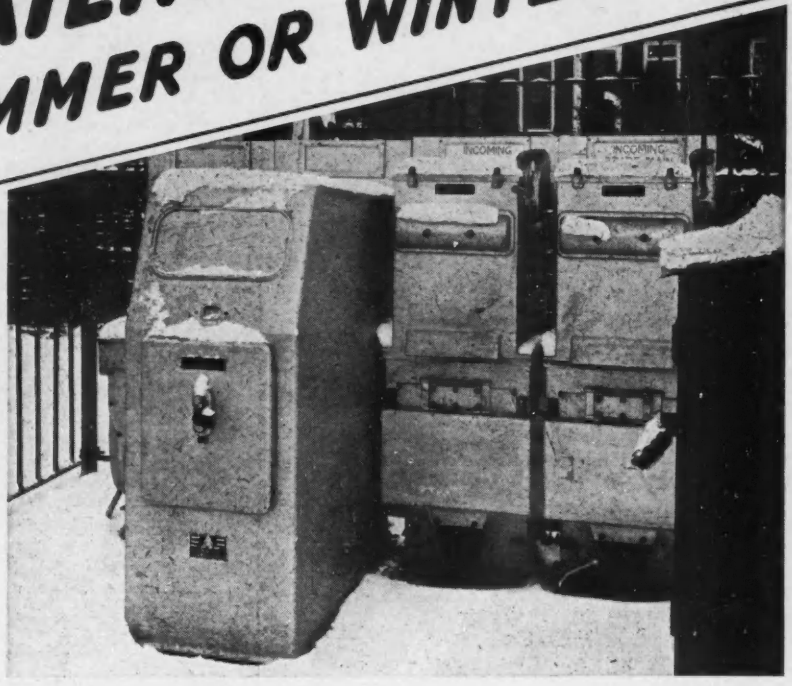

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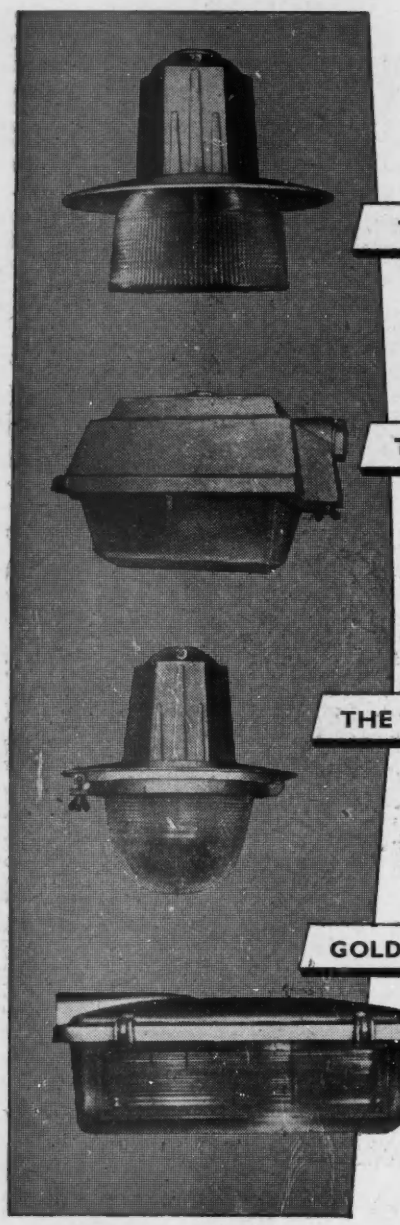

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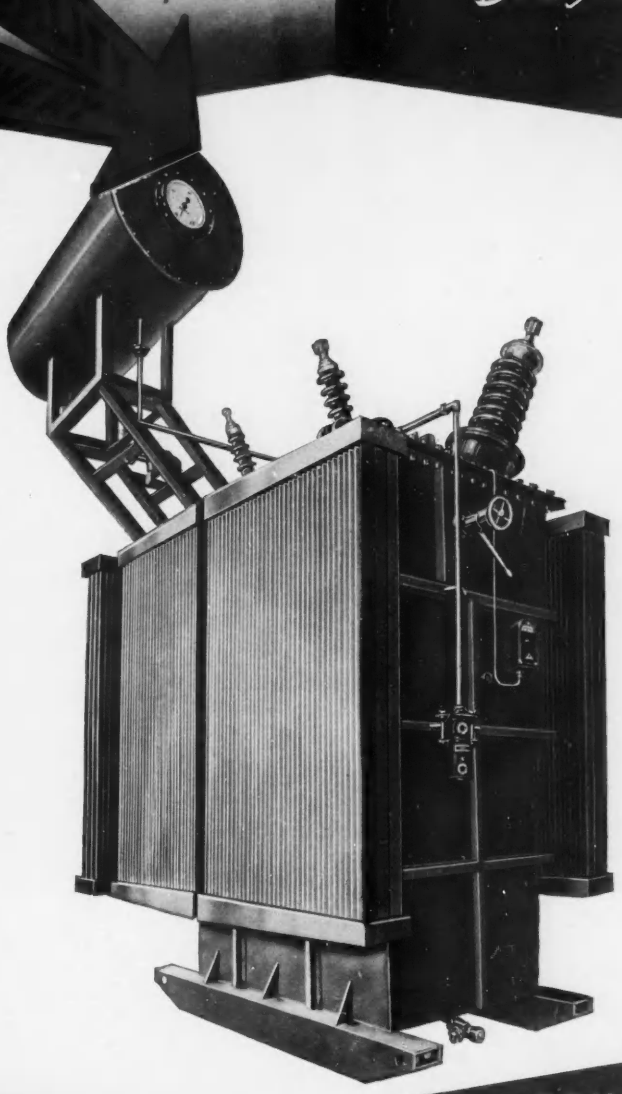

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